THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVI. No. 1945.] LONDON, AUGUST 21, 1900. [52ND YEAR. PRICE 6d.

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Yield of Gas per Ton . 10,500 Cubic Feet.
Illuminating Power . . . 16·4 Candles.
Coke . . . . . 68 per Cent.

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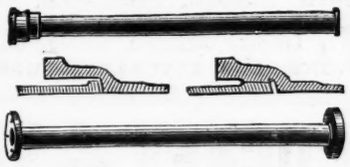
W. RICHARDSON, Fitter.

GAS AND WATER PIPES
1¼ to 12 IN. BORE.



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ESTABLISHED 1848.
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Prices and Analysis of all the Scotch Cannels on Application.

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"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.

The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.

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THE "MELDRUM" FURNACE
At "The SHEFFIELD TELEGRAPH" Offices.
Reprinted from "The SHEFFIELD TELEGRAPH" June 27, 1900.
A SAVING IN FUEL OF £18 PER WEEK.

A couple of months ago when coal, which formerly cost us 8s. per ton rose to 12s. 6d., we read a lecture on the cost of steam production by John Holliday, in which the following paragraph appeared:—

Mr. Bryan Donkin, M.Inst.C.E., has published figures from some tests he carried out with different kinds of fuel in the same boiler, the conditions in all cases being the same; the results are comparable on the basis of the cost of fuel required to evaporate 1000 gallons.

Kind of Fuel.	Cost of Fuel per Ton.	Water Evaporated per Pound of Fuel.	Cost of Fuel per 1000 Gallons Evaporated.
	s. d.	lbs.	s. d.
A. Dust Coke	5 0	6	3 8
B. ,, Welsh Coal . . .	10 0	8	5 3
C. Large ,, . . .	22 0	9	10 11

Discovering that the Sheffield Gas Company made a considerable quantity of coke dust, which they gave away to builders and others, we entered into a contract for a supply for three years. Having a spare boiler, we had Meldrums' forced draught fitted, and soon discovered that coke dust made a very satisfactory fuel for steam raising. Our second boiler was then fitted, and we are now burning coke dust on the two almost exclusively. From an economical point of view, the experiment is very satisfactory, as will be seen from the following figures:—

Average week, Coal only, on One Boiler.

	£ s. d.
45 Tons at 12s. 6d.	28 2 6
Ashes at 2s., Seven Loads	14 0
	£28 16 6

Present Consumption on Two Boilers.

	£ s. d.
Six Tons of Coal at 9s. 3d.	2 15 6
Coke Dust	3 4 0
Two extra Stokers	2 12 0
Flues cleaning	10 0
Ashes, 12 Loads at 2s.	1 4 0
	£10 5 6

We shall be pleased to show the arrangement to anyone interested in the subject of the economical production of steam. There is no smoke from the chimney stack of the "Telegraph" Office, which is another good point in favour of coke dust as fuel.

Makers and Sole Proprietors: **MELDRUM BROTHERS, LTD.,**
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LONDON OFFICES: 66, Victoria Street, Westminster. LEEDS OFFICES: 5, East Parade.
Telegrams: "MELDRUM" Manchester, London, or Leeds. National Telephone: Nos. 1674, Manchester; 193, Westminster 1391, Leeds.

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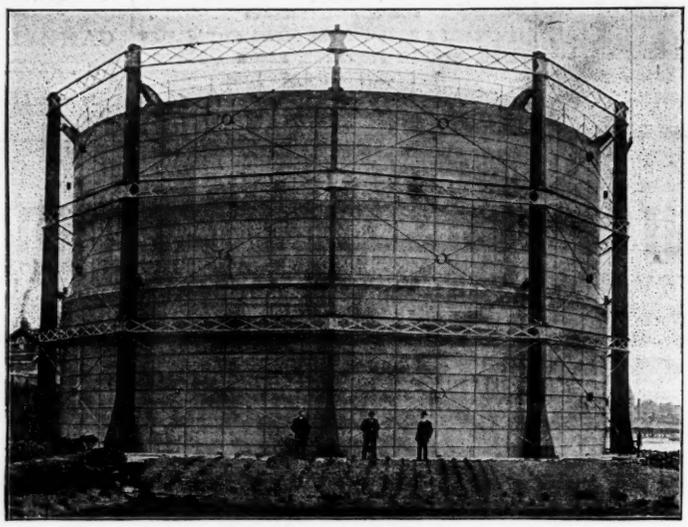

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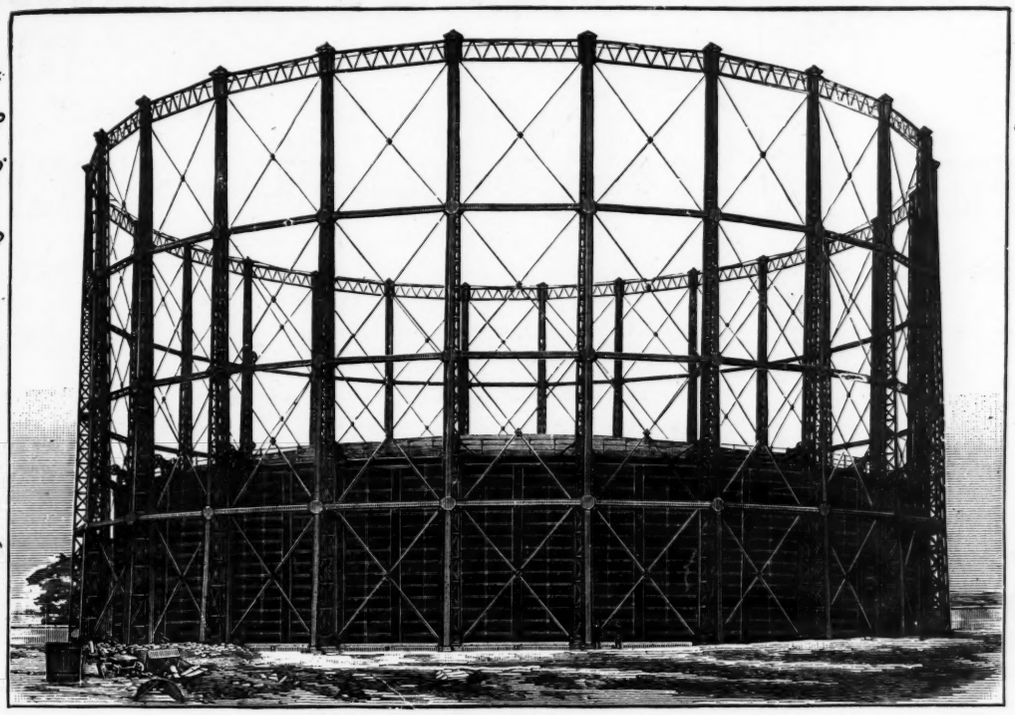

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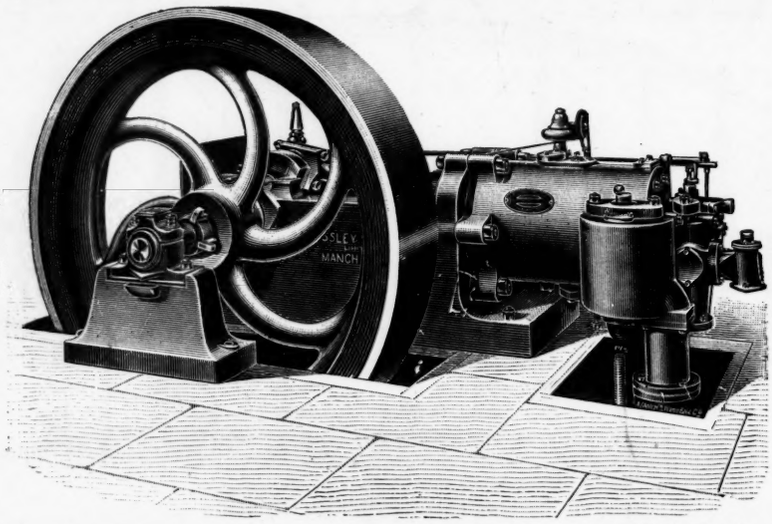

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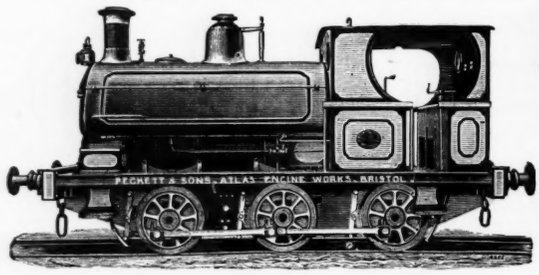

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BREAKAGE OF GLASS REDUCED TO A MINIMUM.

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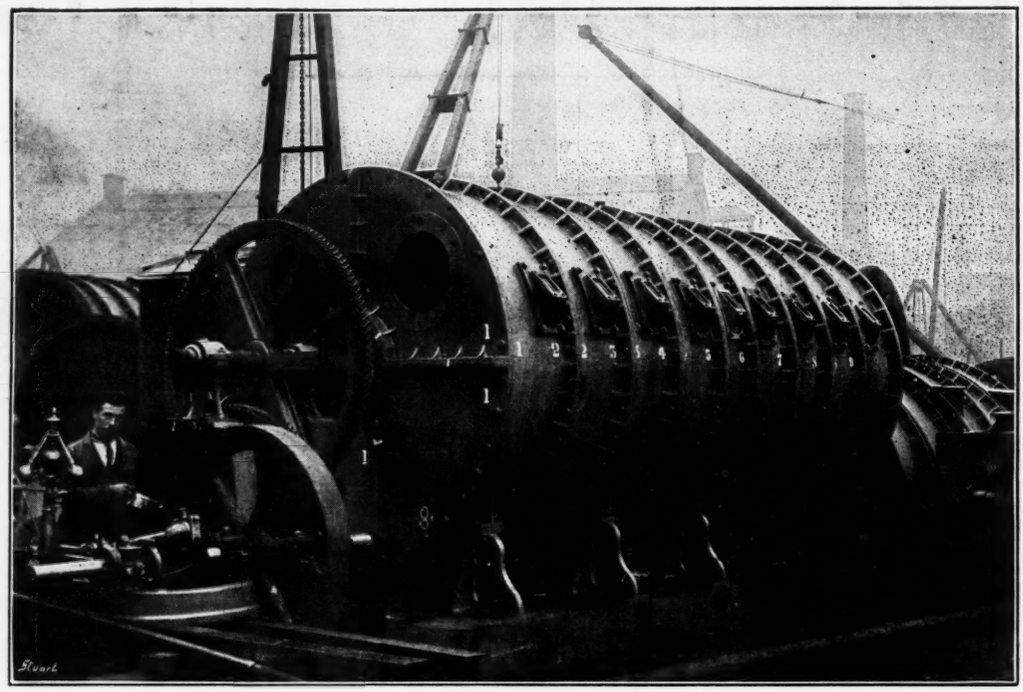

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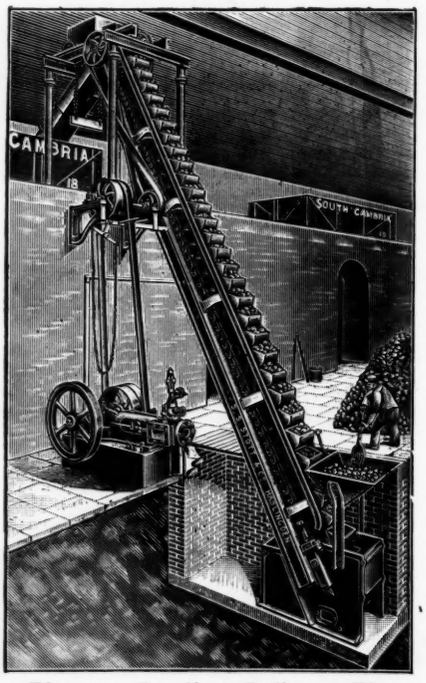

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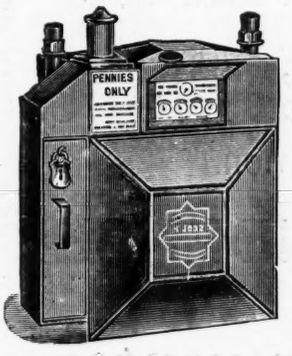

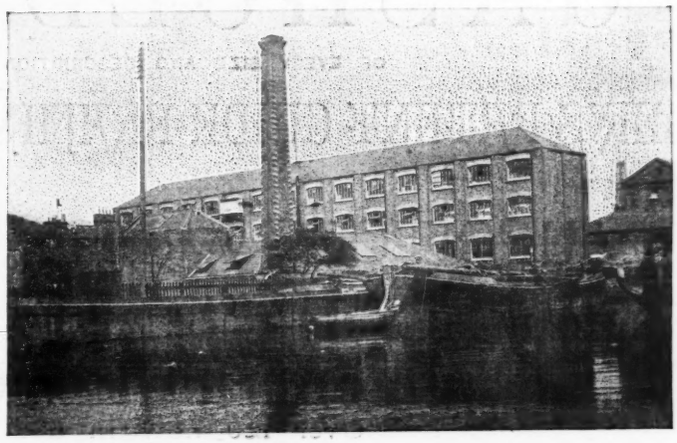

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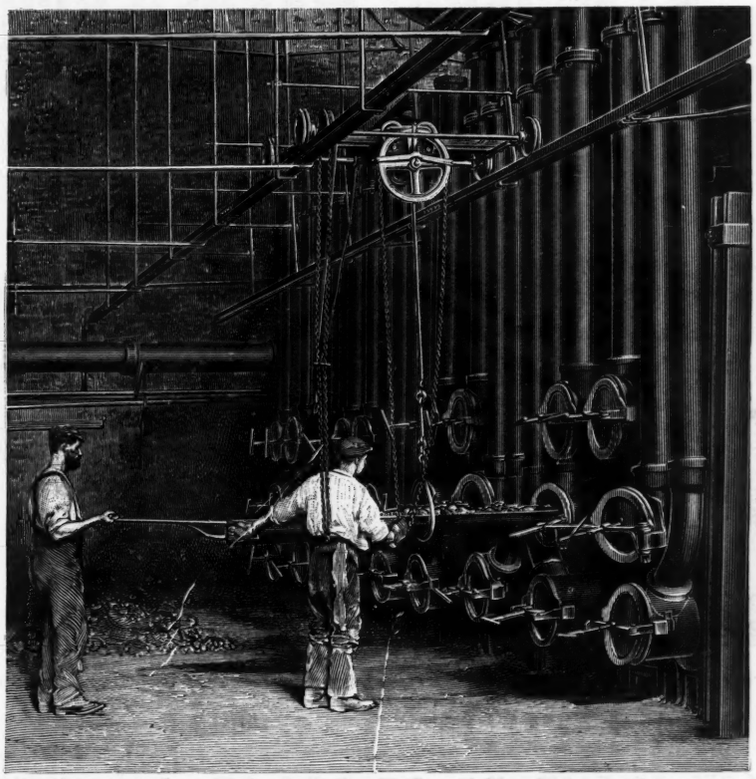

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Cubic Feet of Gas per day are now being Purified by

PATENT "STANDARD" WASHER-SCRUBBERS

which extract ALL the Ammonia and a large proportion of the CO_2 and H_2S.

Prevention of Slip of Gas Unwashed
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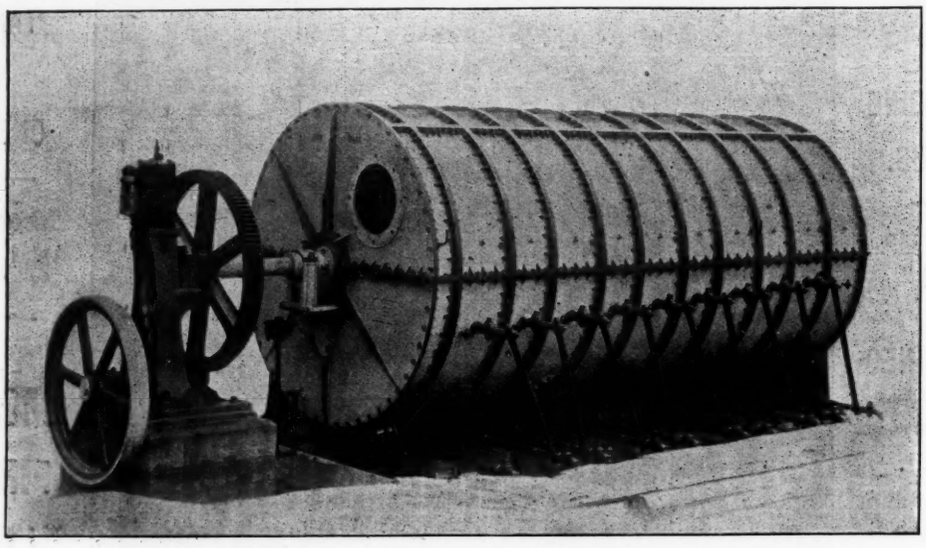

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PHOTO. OF MACHINE (ONE OF TWO) RECENTLY ERECTED AT THE SALTLEY WORKS, BIRMINGHAM.

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Belfast (2nd)	4,500,000	Winchester	225,000	Commercial (3rd)	1,250,000
Brussels	750,000	Shanghai	225,000	Rotterdam	850,000
Brussels (2nd)	750,000	Stockport	600,000	Dorking	150,000
Liverpool	3,500,000	Norwich	1,000,000	McKeesport, Pa.	500,000
Liverpool (2nd)	4,500,000	Holyoke, Mass.	600,000	G.L.&C.Co., Bromley	3,750,000
Tottenham	750,000	St. Joseph, Mo.	750,000	G.L.&C.Co., Nine Elms.	2,750,000
Tottenham (2nd)	750,000	Lea Bridge	350,000	Durham	200,000
Santiago de Cuba	400,000	Lea Bridge (2nd)	350,000	New York	4,000,000
Swansea	750,000	Stockton-on-Tees	500,000	Scarborough	800,000
Manchester	3,500,000	Edinburgh	2,000,000	Perth, W.A.	125,000
Brighton	1,750,000	Guildford	350,000	Bremen	550,000
Preston	1,400,000	Brentford	1,200,000	Maidenhead	225,000
New York	1,200,000	Syracuse, N.Y.	850,000	Epsom	225,000
Southport	750,000	Bridlington	150,000	North Middlesex.	150,000
Bath	1,000,000	Middlesbrough	1,250,000	Wandsworth.	1,800,000
Newburg, N.Y.	350,000	Croydon	1,250,000	Aarhus	800,000
Newburg (2nd)	250,000	L. & N.W. Ry., Crewe	700,000	Falmouth	150,000
Hoylake	125,000	Taunton	225,000	Southampton	800,000

SINCE JANUARY 1ST, 1899.

Hartlepool	750,000	Brighton (2nd)	1,850,000	Dublin (2nd)	2,000,000
Utrecht	1,000,000	Stockport (2nd)	600,000	Faversham	200,000
Deventer	150,000	Croydon (2nd)	625,000	Birmingham (Swan V'ge)	1,500,000
Portsmouth	1,000,000	Maidenhead (2nd)	225,000	St. Gallen (Switz.)	225,000
Bournemouth	1,000,000	G.L.&C.Co., Beckton	2,250,000	Colney Hatch	400,000
Aylesbury	150,000	G.L.&C.Co., Fulham	1,750,000	Southampton (2nd)	500,000
Hamburg	1,750,000	Tottenham (3rd)	350,000	Tunbridge Wells	1,000,000
Redhill	275,000	Sydney (Harbour)	500,000	Hebden Bridge	200,000
Dublin	2,000,000	Sydney (Mortlake)	500,000	Chorley	300,000
Posen	450,000	Manchester (2nd)	3,500,000	Liège	1,000,000
Dunedin (N.Z.)	150,000	Hull	1,500,000	Stafford	500,000
Lincoln	500,000	Longton	600,000	Bridlington (2nd)	200,000
Antwerp	1,500,000	Staines	600,000	G.L.&C.C. Beckton (2nd)	10,750,000
Brussels	1,000,000	Commercial (4th)	2,000,000	Tottenham (4th)	1,000,000

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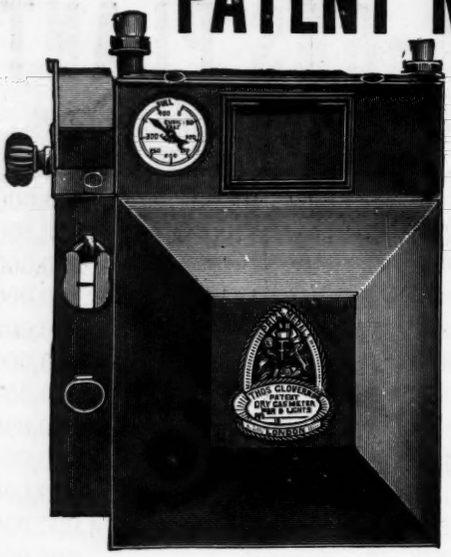

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EDITORIAL NOTES.

Coal Miners' Wages and the Price of Coal.

THE policy of the coalowners of working the advantage over the consumer which they have held for some months past for every penny it is worth, will, unless we are grievously mistaken, bring in due course a heavy retribution, in the dealing out of which the trade of the nation will, as a whole, suffer severely. The very serious situation in which the iron and allied trades will ere long find themselves is patent to anyone who cares to look a little beyond—or, rather, who cares to find out the true inwardness of—the existing state of the markets. Coal is very dear, wages are high; but prices in the iron and steel trades are tottering, and only need the coming shock of competition from America to fall heavily. How is the manufacturer to keep going, when the cost of production exceeds the price of the finished article? He will, in many instances, have no option but to shut down. That this will be a severe blow to the trade generally of the country needs no demonstration.

It will also have a consequent effect upon the coal market, which will break down later on, when the mischief has been done. This does not sound to the coal consumer a very terrible consummation; but there is one side to the question that deserves some consideration. That is, the effect upon the wages of the miners of the fall of coal prices from the present abnormal level, and the consequences of this effect upon the relations between the men and their employers. So long ago as November last, we drew attention to the considerable increase that had taken place all round in coal miners' wages, and showed that at the end of October the rates of pay in force were either practically as high as, or higher than, those paid in 1890-1. Since then wages have risen, and are rising, much higher still, as will be readily seen from the following particulars. At the end of October, the miners' wages in Northumberland and Durham stood at 25 and 33¾ per cent. respectively above the standard of 1879. They now stand at 52½ and 55 per cent. higher than that standard; the previous highest rates being 31¼ per cent. in the one case, in 1890, and 35 per cent. in the other, in 1891. In South Wales, wages on Nov. 1 last were paid at the rate of 28¾ per cent. above the 1879 basis. The percentage now is 58¾, or 5 per cent. higher than the record in 1891. In Scotland, the rate is now double the standard, at which it actually stood no longer ago than 1897; and wages there had never previously risen to more than 50 per cent. above the basis. Finally, the Miners' Federation have quite recently obtained from the owners a considerable modification of the agreement entered into last December, when wages were fixed at 45 per cent. above the 1888 rates, with the understanding that no further increase should be asked prior to Jan. 1, 1901. The Conciliation Board of masters and men have now agreed that a 15 per cent. advance shall be granted—5 per cent. each on Oct. 1, Jan. 1, and Feb. 1. This will make the rate of wages up to the maximum which the Board are empowered to award.

What of that? it may be asked. Miners' wages vary with the price of coal; and it is therefore only in the nature of things that, with coal at present prices, wages should be high. When coal comes down, so will wages. But will they come down with as little friction as they went up? That is the point. Miners have never known such rates before; and Conciliation Boards and sliding-scales (as it is being found in other walks of business life) are best appreciated when they are working favourably to those who are called upon to approve them. We quoted the other day the significant remarks made by Mr. B. Pickard, M.P., to the Yorkshire Miners' Association, as to the necessity and possibility of accumulating out of their higher wages a fund of half a million, "to strengthen themselves against any "evil day that may arise." Again, Mr. Sam Woods told the South Wales men the other day that "if they stuck to "their position, hoarded up their finances, and trusted their "leaders," they would be able to fight the masters over the question of Federation *versus* Sliding-Scale, which threatens the future peace of Wales. Now we find Mr. John Burns, M.P., telling the Nottinghamshire miners that he wanted them "to make the Union the fighting organization to get "for labour that charter of leisure, pleasure, and treasure it "was the duty of every workman to enjoy."

These be ominous signs that the present period of exceedingly high wages is having two results, so far as the men are concerned. They are getting a rate of pay which is quite abnormal, but which they will not at all relish

giving up. Who, indeed, would relish a reduction of 30 per cent. in his income, after getting used to spending the greater amount? At the same time, they are accumulating funds to enable them to fight for a higher *standard* of wages; and if this be the aim of their leaders (and we shrewdly suspect it to be so), there is big trouble in store for the country as a whole, and for coal consumers in particular. We repeat what we said at the commencement—that, by running up prices to a figure quite unwarranted by general trade conditions, and purely artificial, and thereby handing over an equally unwarranted and unearned increase in wages to the men, the coalowners have dealt a heavy blow at the future prosperity of the country, and have put into pickle a rod for their own backs. May our prophesies be proved false as they are gloomy; but similar forebodings appear to be—rather late in the day—entering the minds of the journals of the trade. The "Colliery Guardian" last Friday actually made so bold as to remind the coalowners that there had been times when they had found the support of their consumers useful, and that such times might again return. "The men," said our contemporary, "know that the day will arrive when the "consumer and the owner must say [in regard to the increase "in wages]: 'Thus far, no farther.' Then will come into "play those engines of war which miners all over the "country have been, and are, amassing. Is it altogether "wise for the coalowners to alienate from themselves the "sympathy of the consumers—in other words, the British "public—if, in the near future, they will have to face an "unreasoning adversary in the shape of their own em-"ployees?" Without wishing to hurt the feelings of our "child-like and bland" contemporary, we would ask: How much sympathy for the coalowner is there left in the hearts of the coal consumer to be alienated? The latter will feel that consideration for him comes much too late, and too self-interestedly, to be valued highly.

The Re-Opening of the "Strike Factories."

Circumstances are conspiring to accentuate the warning we uttered last week in regard to the re-starting of "strike "factories" in different places. Reports of labour disturbances have come in from various parts of the Continent; and it is supposed that an organized attempt is in course of development, having for its object the raising of the condition of workers everywhere to that of the "most "favoured" of their class. It is not a little flattering to learn that this term usually means the condition of the British Workman. Representatives of English miners, mechanics, and dock labourers have been abroad egging on the benighted foreigners to agitate for equal treatment; and an outbreak of strikes is the immediate result. Such, at least, is the substance of the reports that have reached us during the past week. It is no mystery, of course, that English coal miners' delegates have been abroad many times of late years; and there is no difficulty in believing that their underground work has been more important than the speechifying in which they have indulged for the amusement of the authorities. Again, one would gladly hope that Continental workpeople had become practical politicians, in the sense of preferring to strike for shorter working hours or for higher wages, rather than talking Anarchy and practising murder. But all this is very doubtful. Talk about equalizing the condition of the working classes all over the world is nonsense, until it has been proved in what equality consists, which is one of the most difficult of all the problems of practical economics. At the same time, it is impossible to withhold sympathy from the man at (say) Antwerp or Berlin, who is dissatisfied because he is only paid at the rate of ninepence for work for which his British brother is paid a shilling. But is it so? We are under the impression that Continental labour, at the large centres of industry, is to the full as dear as in England. It is desirable that the facts of this matter should be known. There would then be less scope for fancy; and of the two, the latter is likely to be the more mischievous. Many studies have been directed to the solution of the old problem, "Which is the happiest "land?" for the wage-earner with nothing but his bodily strength to sell; but the answer remains obscure. It seems tolerably clear that the world everywhere wants workers, more or less skilled, with their hands, and is ready to pay them a living wage for honest and good work. Never were artizans in greater demand. With all the Board Schools turning out poor clerks and indifferent school teachers, this state of things will continue. There are coal trimmers in the Port of London making an income that would be wealth to an Italian politician or a German professor. The equalization of the conditions of labour! It is an idle dream, and must remain so till mankind agrees upon what is money's worth.

With regard to the operations of those "mischievous "bodies," as Lord Claud Hamilton called the Railway Servants' Union, which afflict the public services of this country, it is a good omen that at Bristol the District Secretary of the Gas Workers' Union has received a wholesome setting-down at the hands of the Gas Company's men. It is, of course, an essential part of these Unions' policy to send agitators about to centres where there is industrial peace and contentment. This is called conducting a vigorous campaign; and the emissary (who is usually also a paid correspondent of the Labour Department of the Board of Trade) aims at getting a double "pull" out of the job by having something to report to the past-masters in the craft of strike manœuvring who rule that branch of the Civil Service. At Bristol, a certain H. Brabham had this commission, and he started on the usual lines by convening a meeting on his own initiative of those servants of the Gas Company who might like to have more money for less work. After this meeting, the gentleman wrote to the Board of the Company in his self-appointed capacity of representative of their employees. But this diplomatic document remained unacknowledged by the recipients, who naturally declined to hold any communication with an outsider. Moreover, there happens to be in force in Bristol an agreement—proposed originally by the men themselves, and accepted by the Board—for submitting all questions affecting the workmen to discussion at a meeting of Directors and representative workmen. Whether Mr. Brabham was aware of the existence of this agreement or not, he went on calling his meetings and forcing on his design to get the men under his thumb in the regulation style. Such persons have a certain knack of persuasion; and experience shows that every ten years, or thereabouts, there is some chance for successfully sowing the seeds of discontent among the raw hands of a factory. At any rate, Brabham succeeded so far as to get a meeting of the Bristol men to cast a vote slightly in his favour. A ballot was, however, demanded, which resulted in leaving him in a minority of 137 to 335. This is so far satisfactory as showing that the bulk of the Bristol gas workers are not such fools as to drop the solid advantages of their position for the shadow of such compensation as the Union can offer; but it is nevertheless a warning to gas managers everywhere that no paper guarantees are competent to ward off the insidious attacks of professional agitators.

"Light Gas" for Southport.

There is fair promise that to the Corporation of Southport will fall the distinction of being first to copy the example of the South Metropolitan Gas Company, and abandon the manufacture of heavily-carburetted town's gas. In another column will be found a report of the proceedings at the last meeting of the Town Council, at which an organic resolution submitted by the Gas Committee—"That it is desirable "that the illuminating power of the gas be reduced"—was unanimously adopted. So Southport early joins the procession of those enlightened towns which have perceived the necessity for adjusting their gas supply to the most economical and advantageous conditions of its utilization for all the purposes of lighting, heating, cooking, and the production of motive power. Good luck to the Corporation in their worthy effort! According to the way of the world, the Corporation of Southport, being willing to make a move in the direction of industrial reform, is perhaps the one Municipality in the United Kingdom that is prevented by a treaty with a foreign power from doing its own will in such a matter. Southport, in short, has a partner—Birkdale. Whether this Jorkins in the firm will prove as obstinate as did the immortal original, cannot be made the subject of prophecy. But inasmuch as Birkdale is not a mere sleeping partner with Southport—quite the opposite, in fact—there is ground for hoping that it is not more blind than the head of the firm to the advantages of conducting the business on commercial lines. What Southport and Birkdale will have to do will be to lay their respective municipal heads together, and study the economics of the mutual gas supply in the light of cold, hard facts. The discussion at the recent Town Council meeting sufficiently disclosed the firmness of the grip of

the leading citizens of Southport upon these facts; and it will be no easy task to make them leave go. The standard illuminating power of Southport gas is 20 candles, the same as Liverpool. These two undertakings are the only ones in the kingdom required by Act of Parliament to supply gas of so high an illuminating power; and it is not surprising that one of them should be first to awaken to the conviction that a make of gas which might have been desirable a quarter of a century ago is now out of date.

Working of the Harrow and Stanmore Gas Act, 1894.

Amid all the discussion that has passed of late on the question of the way in which the sliding-scale of gas prices and dividends has realized the intention of those who favoured it in place of the older system of maximum prices with power of revision, it has been overlooked that a modified example of the latter is still operative among us. The gas supply of no more distant nor insignificant a district than that of Harrow and Stanmore was settled so recently as 1894 upon a basis in which the sliding-scale and the principle of outside supervision were artfully blended. As will be seen by the report which appears in another column, the proof of this particular kind of legislative pudding has just been taken, with the assistance of Dr. J. S. Haldane, one of the Metropolitan Gas Referees, acting as a Special Commissioner for the Board of Trade. The law and the circumstances of the case are sufficiently explained in the report, and need not be repeated here. Of course, the first thing the Referee was asked to do was to decide something lying outside the terms of the reference. Harrow is a district with a central area measured by a certain radius, which in this case starts from a hotel; and the Act says nothing about what price shall be charged beyond the radius. The Local Authority naturally wanted to repair their forgetfulness of the outsiders by getting the Referee to say something in support of an alleged "general opinion" that the charge for gas outside should be governed by the price ruling for the time being inside the radius; but he very wisely declined to fall into the trap. This little skirmish should be carefully noted by those who are concerned with the making and interpreting of these parliamentary bargains. Mr. J. L. Chapman, for the Company, is perfectly right in claiming that the settling a price for a strictly delimited central area has no reference to what may be charged outside. Whether or not this ought to be so in the case of Harrow is beside the mark. If the Harrow District Council are solicitous for the interest of the outlying gas consumers, they should have taken better care of them in 1894. It is not to be believed that these consumers really suffer from the neglect of the District Council to protect them in respect of the statutory price of gas, while there is good reason for leaving a company serving such a scattered region free to make their own bargains. The evidence taken by Dr. Haldane is interesting reading; and he appears to have been most desirous of understanding the points of the case submitted to him. In the event, the Company received permission to make the very moderate increase of 3d. per 1000 cubic feet for which they asked, commencing at the next quarter-day, and terminating at Midsummer, 1901. So far, the novel statutory provision proved to be workable; but whether it can be regarded as constituting any real protection of the public against a (supposed) extortionate Gas Company is not so obvious. There is something in the view that it is only another and a superfluous device for registering the inevitable. Certainly, nothing of the kind seems needed in the case of a Gas Company not paying full dividends.

The Meeting of Irish Gas Managers.

Nomenclature, despite Shakespeare's oft-quoted sneer at it, plays a very important part in the affairs of the world. So the gas managers in Ireland have found in connection with the working of their Association, and so we find in the heading to these observations; for, though there is no doubt that the meeting which was held at Sligo on Tuesday last was a meeting, at the start, of the North of Ireland Association of Gas Managers, before it had gone far it was converted into one of the Irish Association of Gas Managers. This change, notwithstanding that it had met with keen opposition on former occasions, was this year made without a dissentient voice. The reasons for holding to the old name having disappeared, we need not resurrect them here; and consequently, accepting the change of name as having been made with the approval of all, we only refer to the reasons for the change. The principal of these is that the Association has been creeping southwards, and was no longer, in fact, a North of Ireland Association. The southern infusion, it is anticipated, will be accelerated by the dropping of "North" from the appellation. We hope it may be so, and that the Association under its new name may be even more prosperous than it has been under the old. But it is the duty of everyone to recognize that the movement towards the association of gas managers in Ireland originated in the North, and that it is to northern managers—especially to the energetic action of Mr. James Whimster, of Armagh—that there has been any organization to which southern managers could have any desire to seek entrance; and, further, that the objection to the name was a very slender peg upon which to hang aloofness. We are led to expect that, now that the northern men have enlarged their fold, the southern men will flock into it. We have doubts upon the subject, but shall be glad if the experience should be such as to show them to be groundless. While we approve, and commend, the change in the name of the Association, we anticipate that, under its new name, it will be no sweeter a centre of activity than it has been hitherto.

In one respect the Sligo meeting suffered from a cause which is greatly to be regretted, although it has to be admitted that this cause grew out of the circumstances. When the programme was issued, no papers had been promised; and this, coupled with the fact that the place is distant and difficult to reach, led to the non-attendance of many. Concurrently with this resolution on the part of some to absent themselves, a desire fired the bosoms of others to make the meeting a success; and two papers were submitted which did not appear on the *agenda*—thereby making up quite a full day's work. The members who stayed away because the fare was to be meagre, lost the enjoyment of a satisfying repast; while those who contributed the abundance did so to a small gathering.

The same reasons acted detrimentally to the meeting in another way. In the absence of papers, the burden of carrying on the proceedings fell upon the shoulders of Mr. C. B. Tully, the President. There was danger of the meeting resolving itself into a "one-horse show;" and this it would have done but for the timely appearance of the papers by Mr. Percy Griffith and Mr. Reid. As to the way in which Mr. Tully braced himself to the task before him, there can be but one opinion. To describe him as an all-round man is not sufficient. He is more; he is a many-sided man. The gas-works he manages are full of wonders—some of his own invention, and others his selections from the best productions of others. But had it been, in reality, a one-horse show, Mr. Tully would have made it a worthy one. His address contains a record of high attainment, because he started low—exceedingly low—and has brought his works forward to the front rank of their kind. To be able to collaborate with Professor Lewes is beyond the power of most; yet Mr. Tully has risen to that estate, as was shown by his communication upon the water-gas plant at Sligo. The meeting will, without doubt, lead to a quickening of the interest of gas managers in the development of this ingenious adaptation of scientific principles in the production of water gas. But Mr. Tully, however his belief may be as to one thing at a time, does not believe in holding to one thing only. Having produced his water gas and carburetted it, he wishes to further improve its illuminating power, or at least to provide a ready method for the enrichment of poor gas. The idea is not new, but the application of it is rare; and Mr. Tully's apparatus, which, as usual, he thought out for himself, formed another worthy contribution to the Sligo meeting. This appliance is of interest to managers in small towns for two reasons. One of these is found in the remark of Mr. Tully that, with the apparatus placed after the governor, the enrichment takes effect over the town in from five to ten minutes. The problem of dual supply is thus solved, generally, for small places. The other reason lies in this—that coal which is frequently described as "muck" may be employed to make the gas; and then it can be enriched to the desired standard, which means a great deal in days of dear coal. But even yet Mr. Tully's list was not complete, for the members of the Association were taken to the gas-works to see in operation the "Rapid" retort-charging plant, which more than justified itself as a cheap and efficient charging apparatus.

Mr. Griffith's paper was dictated by a desire on the part of many to see the gas industry in Ireland developed so as

to keep it in line with what is going on on this side of the Channel. In too many instances, so long as the dividend comes in, there is a feeling that well should be left alone. The works are allowed to fall behind, and the undertaking may be said to be eating its own head off. The paper was welcomed as providing a means for urging owners of gas-works to move forward. The paper by Mr. W. A. Reid, of Longford, on a sulphate plant which he works, was of a kind which is suited for such a meeting, and it received a homely criticism.

The Cause of the Municipal Civil Servant.

On several occasions it has been the task of the "Journal" to plead the cause of municipal officers, and to advocate the erection and consolidation of a sound system of appointment, pay, and promotion for the municipal civil service of the country. There is no more important subject for the study of those public-spirited citizens who aspire to serve their generation in the way of local self-government. Men get themselves elected to some local office on all manner of pretexts, but rarely in the professed cause of fair play to the public officers. Yet usually one of the first of the Corporation Committees to which young Town Councillors are assigned is that which has to do with the government of the executive staff. It is not surprising that sometimes an ardent "ward politician" who has had slight personal experience in such matters, finds it difficult to get the proper focus for observing the duties and emoluments of public officials of much higher social position than his own. It speaks highly for the common sense and political instincts of our people that so little friction, on the whole, arises from this source. There is always, however, a latent possibility of trouble in a service where there is no recognized system of regulation in this matter. Speaking generally, and therefore in some degree inaccurately, we venture to question the existence of any such system in many of the local governing organizations, large or small, of this country. Nobody would for a moment desire that, in this respect, there should be a hard-and-fast uniformity throughout the land. What is to be desired is that every district should realize its own wants, and arrange for supplying them upon what passes at the time for a generally accepted standard of adequacy. "We have certain positions of "trust and responsibility to fill—what conditions should be "attached to those positions which will satisfy the right "kind of officer, and warrant the community in expecting "the best kind of return for cash paid and consideration "given?" That seems the correct way of stating the case. It would naturally follow that members of Local Authorities should adjust their view of the subject to this presentment of it. Unfortunately, there is far too much evidence to prove that these bodies do not do business on systematic lines.

Not to cite instances too closely connected with the administration of Corporation Gas Departments—when we might be found treading on particular toes—we will give an example of how a Joint Sanitary Board in Devonshire recently set about appointing a Medical Officer of Health. The Committee nominated to deal with this business recommended that on the retirement of the actual incumbent, his successor should be appointed at a reduced salary of £150 per annum. When the matter came up for confirmation, a member of the Board suggested that it would be better to pay £200 a year: "They were dropping from "£270 to £150, with the result that whoever got the "position would be immediately applying for a rise." This was very evidently a man of the world. Another member thereupon stated that "they had got returns" from a number of other districts, and found that these were paying far less for the same offices. This was the "circular-of-"inquiry" fiend. Eventually, the recommendation of the Committee was adopted, "subject to the approval of the "Local Government Board." The last observation recalls the peculiar condition of Government supervision under which local governing bodies do their uncommercial work. They are popularly credited, in the newspapers and on political platforms, with doing the ordinary work of local government and sanitary improvement with such conspicuous ability that they must be fairly allowed to be competent to transact all sorts of other business. But people who are not carried away by the hare-brained chatter of generalizing politicians and journalists, know that this measure of efficiency, such as it is, is largely due to the silent pressure of the great Department in Whitehall. There the authorities, who do not permit their names to appear, patiently and incessantly sift tables of mortality, and pass in review the resolutions taken by Sanitary Authorities, suggesting this course, or correcting that threatened blunder, by the light of their own highly elaborate system. Of course, this centralized system is a little cumbrous in operation; and the cultivated and advanced sanitarians of the great towns fret at its ponderous march. But what it effects in the way of preventing injustice to individuals, nobody could adequately describe. Trading departments of Corporations are under no such superior regulation, which is all the more reason for invoking that systematic study of the problem of the municipal civil service which we have so strenuously advocated for members of Local Authorities.

The Home Office Report on the Workmen's Compensation Act.

In another column will be found a digest of the more important and interesting points in the Home Office report upon the working of the Workmen's Compensation and Employers' Liability Acts during 1899. The report is the first which covers a complete year's proceedings under the Act of 1897; and it is in its bearings upon the operations of that measure that it will be of most interest to our readers and the public generally. The critics of the Act (especially those who are so fond of dilating upon the supposed abnormal mass of litigation to which it has given rise) will not, we feel sure, hasten to call attention to the facts set forth in the report. For, although the returns which can be collected by the Home Office do not touch the great body of cases which come within the scope of the Act, that very fact disproves the contention of the critics that the measure is essentially of a litigious character—these returns relating chiefly to, and recording, all the cases of litigation under the Act.

How does the aforesaid criticism look in the light of the dry, uncoloured facts? There are not any official returns obtainable of the number of accidents which occur, and which come within the provisions of the Act; but, from creditable particulars supplied by the Miners' Relief Societies, it appears that, while some 70,000 miners were last year disabled for periods exceeding a fortnight, only 128 claims under the Act were brought into the County Courts. That is a proportion of one adjudication to five hundred accidents. Moreover, it cannot be said that the Home Office estimate of an annual total of 150,000 accidents causing incapacity for more than fourteen days is in any way excessive. Yet only 1347 cases (or less than 1 per cent. on that estimate) were commenced in the County Courts during 1899; and of these 348 were settled out of Court, while only 54 were subsequently carried to the Court of Appeal. There remain to be added 292 cases in the Sheriff Courts, and 18 cases removed to the Court of Session in Scotland. Truly, the "litigation" criticism, in view of these facts, looks not a little ridiculous.

But if we go more closely still into the facts, the criticism loses yet more of its substantiality. For the cases carried into the County Courts are by no means to be all reckoned as litigious, the Judge acting more frequently as an arbitrator as to the amount of the compensation than as a judge to determine disputed liability. That this is so is evident from the fact that in nearly one-third of the cases decided in the Courts last year the award took the shape of a lump sum, and of those (numbering 317) some 225 were in respect of fatal injuries. Now we know for a fact that some employers always refer to the County Court the decision as to the amount and allocation of the compensation payable on the accidental death of a workman—not because they wish to dispute their liability, but in order to have the amount legally certified, and to relieve them of the responsibility of determining the way in which the sum awarded (generally close upon £200) shall be apportioned among the dependants or invested for their benefit. Such references cannot, of course, be classified as disputed claims. In fact, the only cases which can genuinely be classified under the heading of litigation are those carried to the higher Courts; and of these the majority are in the nature of definitive actions, some at least of which will form precedents obviating the need for similar appeals in the future. That is to say, the first two or three years of the working of a measure so wide in its scope and so novel in its principles and procedures as the Compensation Act of 1897 are certain, as we have always contended, to witness a number of appeals to the Courts

for the decision of the subtle points which the legal mind can always raise in regard to provisions, the intention of which is perfectly obvious to the layman, be the wording never so slightly ambiguous. The future will certainly see a falling off in such appeals. But, even taking the 1899 figures as fairly representing the probable annual average of litigation, can one case of appeal to every three thousand accidents be held to justify the favourite gibe at the Act, and, more especially, at its authors?

One feature of the returns that is noteworthy is the considerable number of instances in which lump sums have been awarded in original settlement of claims for total or partial incapacity—that is to say, other than in commutation of previously granted weekly allowances, as to which no information is available. The Act, it will be remembered, provides (Schedule I., 13) for commutation at the option of the employer, after an allowance has been paid for at least six months; but it now appears to be held that the law allows the workman to accept a lump sum in settlement of his original claim, or to commute by agreement before the six months are completed. The danger is that a workman, under stress of momentary necessity, or through ignorance, may commute his right for a sum much less than its real value. And some insurance companies would probably not be superior to the temptation of "trying it on."

The statistics published are of much interest and value, but are of necessity only fragmentary, as there is no provision, and it would perhaps be impossible to enact, that employers should report upon every case of accidental injury to their men; and, indeed, the collection and digestion of such reports, if obtainable, would entail the expense of a special department with a considerable staff. There is, however, one source (indicated in the report) from which much valuable and already tabulated information could be obtained, if its supply were rendered compulsory—namely, from the insurance companies. There ought to be no difficulty, and there would be much advantage, in enacting that those companies should supply the Home Office with statistics. Short of that, we must remain satisfied with the information contained in the reports as issued, supplemented by that which reaches us from unofficial sources. The authors of the Act have certainly no reason to be at all dissatisfied with its working, so far as it is revealed in the available returns.

WATER AND SANITARY AFFAIRS.

The allied subjects of sanitation and the public health have come out rather prominently during the past few weeks. The proceedings at the meeting of the British Medical Association recently held at Ipswich would have been singularly incomplete had they been restricted to questions concerned solely with the treatment of disease, which may be said to be the special work of the physician, and had excluded all reference to the measures which have been adopted of late years to prevent its appearance, mitigate its severity, and check its propagation. It was therefore gratifying to the labourers in this field to find that the President (Dr. W. A. Elliston) took notice, in the course of his address on the evolution of the modern physician, of the advances made in sanitary science during the past half century. Though this science may be said to date from the time of Moses, whose elaborate directions for the preservation of health most people would have been willing to acknowledge were of high value, it was not till comparatively modern times that endeavours were made to have them systematically followed, and the beneficial results of so doing generally recognized. Three hundred years ago, the mortality in London was 80 per 1000 of the population; while in the week ending the 11th inst. it was only 20·5—the figures for the four preceding weeks having been 20·1, 21, 16·1, and 14·2. North of the Tweed, in the past fifty years the average length of life has been raised to a figure between six and seven years for each person born. There cannot be much room for doubt that this lowering of the death-rate is the outcome of the gradual improvement in the conditions under which our large population lives, and to the greater facilities afforded, by the provision of a more ample supply of water, for closer attention to personal cleanliness. The chief factor in bringing about this very desirable result was the foundation of the modern science of hygiene by the late Dr. Parkes towards the close of the first half of the century, about which time the first General Public Health Act was passed. The work done by the old Board of Health was good in its way; but reform was called for, and the appeal was responded to by the creation of the Local Government Board in 1871, and the passing, four years later, of the Public Health Act. The outcome of the study of sanitary science by Dr. Parkes has been the organization of a system of general and individual supervision which makes for a higher standard of public health; and though it would be absurd to suppose that improved sanitation will eventually stamp out disease, it may be confidently asserted that it will enable the physician to more effectually grapple with it when unhappily called upon to do so.

It is, of course, the dwellers in towns who have profited most by the greater attention to hygiene to which reference has been made above; and therefore it is not surprising to find urban populations increasing by the influx of labourers from the rural districts, and a tendency to forsake agricultural pursuits for the higher pay and the more cheerful surroundings of town life. The spread of education and the facilities for travel are in a large measure answerable for this condition of things; while another factor, according to Dr. Thresh, the Medical Officer of Health for Essex, is this improved sanitation of which we have been speaking. In his address as President of the section devoted to State Medicine at the meeting of the British Medical Association, in which he dealt with the subject of rural sanitation, he pointed out that this desertion of pastoral districts is every year rendering the feeding problem more serious. We are, with our rapidly increasing populations, consuming more and producing less; and Dr. Thresh is afraid that this will go on until we receive a rude awakening—one which, indeed, will "stagger "humanity." He is hardly surprised that the villager should take himself off, bag and baggage, and change his abode from a place where "nuisances from the improper "disposal of filth abound on every side, and the water "supplies too often are unsatisfactory in quality as well as "in quantity," for one where he will enjoy advantages which tend to increase health, prolong life, and make it better worth living. Nor are we. The modern rustic is not so rooted to the spot as were his ancestors; and he has no particular concern as to whether or not his depature for the town will, in however small a degree, render the country more dependent upon outside sources for her wheat supply. The problem is how this migration is to be stopped, and how the peasant is to be brought back to the soil. That is the difficulty. Dr. Thresh is of opinion that one of the chief requirements for restoring rural prosperity consists in giving increased facilities for acquiring small areas of land for sanitary purposes. He says, if this were done, the necessity for carrying out a system of sewers would be avoided in most rural districts; while in compact villages the expense would be willingly borne if land upon which the sewage could be disposed of were obtainable on fair terms. But when, in view of the carrying out of a sewage-disposal scheme, land goes up from £5 to £100 an acre, the fact acts as a deterrent, and sanitary works are neglected. He thinks that if the result of the experiments now being made in connection with the bacterial treatment of sewage should be the discovery of some simple process requiring but little land, a great advance would be rendered possible in rural sanitation. In addition to improvement in this particular, he urges the provision of decent cottages for labourers. The whole problem bristles with difficulties; but, as Dr. Thresh says, this is no reason why it should not be attacked. We are afraid, however, that the carrying out of the improvements he suggests will scarcely be sufficient to induce those who have forsaken village for town life to cheerfully relinquish the brightness of the latter for the dreary dulness of the former. Something in the way of recreation must also be provided.

While Dr. Thresh looks hopefully to modern systems of sewage treatment to assist in the solution of the problems connected with rural sanitation, Dr. A. C. Houston questions whether they can be depended upon to remove the typhoid bacillus and allied organisms. In a paper read at the same meeting, he characterized septic tanks, whatever might be their advantages from the chemical and practical standpoint, as little better than modified cesspools, from the point of view of the epidemiologist. He therefore confined his remarks entirely to bacterial filters, and declared that the mechanical separation of the micro-organisms in sewage by the use of these beds is virtually impossible—that, in fact, until positive evidence to the contrary is forthcoming,

effluents therefrom must not be regarded as safer, in their possible relation to disease, than crude sewage itself. He pointed out that he was dealing chiefly with the Crossness experiments (on which, it may be remembered, he has been engaged in association with Dr. Frank Clowes, the Chemist to the London County Council), and that it did not follow that the results obtained there have a constant value in the case of all bacterial filters. He added, however, that, from the chemical and practical point of view, the coke-beds at Crossness are highly efficient—the effluents being apparently non-putrescible. The lesson of these experiments appears to be to raise a doubt as to any bacterial process in practical operation at the present time detaining the sewage for a sufficiently long period to allow of the complete destruction of all the pathogenic germs by bacterial agencies. At the close of Dr. Houston's paper, Dr. Thresh was fain to acknowledge that the whole subject needs investigation. But who is to undertake it?

Dr. Percy F. Frankland, speaking on this matter at the congress of the Royal Institute of Public Health lately held in Aberdeen, expressed the opinion that it should be handed over to an Imperial Board of Health, formed on the model of the Massachusetts State Board of Health. He is evidently dissatisfied with the work of the Local Government Board—more, we take it, from their lack of initiative than from the incapacity of the permanent officials and staff to deal with the various questions which come before them. Undoubtedly, the Board which Dr. Frankland cites as a pattern has done some excellent work; and, much as we deprecate the multiplication of these responsible bodies, there is much force in his suggestion. It does not seem right that important scientific investigations should be carried on in this country, as they no doubt are, frequently at private expense, and upon the premises of the investigators, who receive little or no encouragement of any kind. Dr. Frankland therefore calls for the creation of an Imperial Board of Health, having at its head a Minister with Cabinet rank, under the auspices of which scientific inquiries should be systematically prosecuted by men who have shown themselves to be competent to carry on work of the kind. Such a Board would, he considers, be able to initiate and lead in matters connected with public health; while its administrative functions would be guided by the scientific thought and achievement of the day, instead of being based upon the often obsolete knowledge gained a generation before. Should this idea be carried out, and a special Board also be formed for the administration of the water undertakings, the Local Government Board would be relieved of some of its present work, which, according to report, is found to be too heavy for prompt despatch. As to how the business now concentrated would be carried on when divided, we need not speculate until one or other of the projects referred to begins to take definite shape.

The Private Bill Legislation of the Past Session.—During the session just closed, 272 Private or Local Bills were submitted to Parliament; and of these 231 were passed, and received the Royal assent.

American Coal for Europe.—According to a telegram, dated last Friday, received through Reuter's Agency, the steamers *Trevanian* and *Rathmoor* have been chartered to carry coal from Philadelphia to France; and it is stated that five more will be chartered for the same purpose.

Gas and Electricity Works in Germany.—On the 1st of March last, Germany possessed 652 electricity works, against 489 in 1899; while 122 were in course of erection, and 17 were expected to start in July. The number of gas-works still exceeds that of electricity works; but 900 places have the electric light against 850 illuminated exclusively by gas. Gas-engines are used for supplying the power in 29 works.

Manchester District Institution of Gas Engineers.—The 123rd Quarterly Meeting of the Institution will be held at Ripon next Saturday. We learn from the programme issued by the Hon. Secretary (Mr. S. S. Mellor, of Northwich), that on arriving, just before noon, the members and friends will be driven to the Crown Hotel, where luncheon will be served. After this, the small amount of business on the *agenda* will be transacted under the presidency of Mr. T. N. Ritson, Assoc.M.Inst.C.E., of Kendal. The party will then proceed to the gas-works of the Corporation, over which they will be conducted by the Manager (Mr. E. E. J. Anderson). In the afternoon, they will drive to Fountains Abbey, and spend a little time in the inspection of these interesting ruins. On returning to Ripon, opportunity will be afforded, by permission of the Dean, to visit the Cathedral. The Mayor (Mr. R. Wilkinson) will entertain the members to tea. Ripon will be left soon after six, and Manchester reached by about half-past eight.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 486.)

THERE was a fairly marked improvement in the general aspect of things in the Stock Exchange last week. There was a moderate recovery from the previous state of stagnation; but anything like an approach to activity was not to be expected at this time of the year. Prices generally inclined in the upward direction, influenced by a more comfortable feeling in regard to Chinese affairs, and by the easier condition of the Money Market—Consols leading the way in obedience to the latter factor. There was a little inclination to fall back on Friday while closing down for a holiday the next day. The settlement was light and free from difficulty. The Money Market has eased to a remarkable degree; large arrivals of gold having quite undermined previous rates. Business in Gas has been more active than in the preceding week, as, indeed, it could scarcely help being; but beyond this there was evidently a better feeling in regard to values. Not that prices have risen to a marked extent—the volume of business done giving no scope for any strongly pronounced movement; but there were signs of a good undercurrent setting in the upward direction. A number of issues were marked *ex div.*, and in almost all the attendant variation in quotations was favourable. In Gaslight issues, the ordinary was moderately dealt in at advancing figures; so that, from 98 *cum div.*, it closed at 97½ *ex div.* But the maximum was put down a point. South Metropolitan was buoyant also, advancing from 127½ *cum div.* to the same figure *ex div.*, or a difference of £2 13s. 4d. Commercial was steady at good middle figures. Very little was done in the Suburban and Provincial Companies; but Brentford, Bromley, and Crystal Palace were all higher *ex div.* The Continental group was extremely inactive, but with a firm tendency; and Imperial advanced a couple of points. Among the rest, Buenos Ayres was lower, and River Plate higher. Changes in Water were few and unimportant; but New River shows an improved dividend of 14 per cent. per annum, or, to be exact, £6 19s. 5·476d. for the half year.

The daily operations were: Gas stocks were not very active on the opening day; but prices were good. South Metropolitan rose 1; but Buenos Ayres debenture fell 1. In Water, Southwark rose 2; but West Middlesex debenture fell 1. Tuesday's dealings were quieter; and prices did not move. On Wednesday there was a shade more activity; and River Plate rose ½. Many *ex div.* advances were made. Thursday's business was about on the same level. Gaslight ordinary advanced 1, but ditto maximum fell 1. Business eased down on Friday; but prices were good. Imperial rose 2. The Exchange was closed on Saturday.

THE WORKING OF THE EMPLOYERS' LIABILITY AND WORKMEN'S COMPENSATION ACTS IN 1899.

THE Home Office have recently issued a report giving such statistical information as it has been possible to collect with regard to the working of the Employers' Liability Act, 1880, and the Workmen's Compensation Act, 1897, during last year. As the latter Act only came into force on July 1, 1898, the statistics for that year were merely fragmentary, and did not provide any real basis for a judgment as to the working of the measure. The present return, therefore, contains the first statistics of proceedings under the Act for a complete year, and is also the first return in which the statistics of cases under the Employers' Liability Act show the effect of the new legislation upon the old. The Workmen's Compensation Act, while it provides for complete returns being made to the Registrar of Friendly Societies with regard to the schemes certified by him, contains no provision for any returns as to the general working of the Act. The Home Office, however, obtain and tabulate complete returns as to the cases which come before County and Sheriff Courts, and as to those cases where memoranda recording agreements as to compensation, and awards by private arbitrators or committees, are registered in the Courts. They further obtain particulars of cases carried to appeal in the Supreme Court and the Court of Session; particulars of references made by the Courts, arbitrators, and Committees to the Medical Referees; and, in addition, statistics and general information from the Chief Registrar of Friendly Societies as to mutual schemes certified by him.

While the returns compiled from these sources contain much information of interest, they leave untouched, as the Home Office report points out, the great body of cases under the Act. In the majority of cases—compensation being settled by agreement or informal arbitration, and no memorandum being registered—no official information whatever is available. The most that can be done is to draw certain inferences as to the number and character of such cases from the statistics of the proceedings before the County Courts, and from the statistics of accidents reported. As with the 1897, so with the 1880 Act. Official information is available only with regard to those cases which are made the subject of legal proceedings. There is no direct information as to the cases—presumably much more numerous—which are settled without litigation.

The first table in the return shows the number of cases under

the Workmen's Compensation Act dealt with in England and Wales during the year 1899, by County Court Judges and arbitrators. The total number settled by these officials during the year was 999, of which 828 were decided by award of the Judge, 98 by award of an arbitrator appointed by the Judge, and 73 by acceptance of money paid into Court. There were, in addition, 348 cases brought before the County Courts which were afterwards withdrawn, settled out of Court, or otherwise disposed of in such a way as not to enable the results to be definitely stated. Of the 999 cases finally settled within the cognizance of the Courts, the decision in 753 cases was for the applicant, and in 246 for the respondent. In 317 of the cases in which compensation was granted, the award was a lump sum, and in 418 a weekly payment; while of the remaining 18 decisions in favour of the applicant, 13 related to cases of applications for termination or redemption of weekly payments, 2 were cases in which only a declaration of liability was made, and 3 were cases in which the amount of compensation was not settled.

The 317 awards of lump sums comprised 225 in respect of death and 92 in respect of injury. It is a remarkable fact that in only 6 of the 225 cases of death were no dependants left by the deceased. In the remaining 219 the total compensation awarded amounted to £37,905, or an average of just over £173 per case. This is less than the average (£200) for the six months of 1898 during which the Act was in force; but the figures for that period were too small to give a trustworthy average, and, indeed, it would be well to await the statistics for one or two more years before assuming any figure to be a reliable average. As has been said, there were 92 cases in which the compensation for injury took the form of a lump sum. In 12 of these the plaintiff accepted money paid into Court; in the remaining 80 a lump sum appears to have been awarded in lieu of weekly payments, by mutual consent of the parties. The total amount of these awards was £2955, or an average of £32 odd in each case.

Of the cases of injury in which a weekly sum was awarded, 169 were cases of total and 249 of partial incapacity. The average weekly allowance in the former was 10s. 11d., in the latter 9s. 2d. —figures comparing with 11s. 4d. and 12s. 10d. respectively for the last six months of 1898. It was noticed, as a curious fact, at the time that the figures for 1898 were published, that the average award for partial was higher than that for total disablement. This result appears now to have been accidental, and not normal; the figures for 1898 being too small to furnish a true average.

The second table gives the number of cases in which memoranda were registered in the County Courts, and shows which were settled by agreement, which by committee, and which by arbitrator. The figures are 651, 89, and 23 respectively. These numbers represent only a very small proportion of the agreements under the Act, and of the decisions of committees and informal arbitrators. Apparently, it is still considered unnecessary in most cases to go to the trouble of registering memoranda—indeed, nearly one-half of all those registered were reported from two adjoining County Court districts in the North Riding Circuit, showing that it has been the regular practice to register agreements in these two districts and nowhere else. The average compensation awarded under registered agreements to dependants in cases of fatal accidents was rather less than £174, or but a few shillings more than the average awarded by adjudication in the County Courts. The average weekly payment agreed to in cases of total disability was 12s. 3d.; and in cases of temporary incapacity, 11s. 6d.

The third table gives the figures relating to proceedings under the Employers' Liability Act in as nearly as possible the same form as those in Table I.—relating to the Act of 1897. In the case of the 1880 Act, the tabulation is simpler—first, because all cases except those removed to the High Court are decided by the County Court, there being no arbitrators; and, secondly, because the damages awarded can always be stated as a lump sum. For the purposes of comparison, the cases under each Act have been arranged in six groups according to the employment in which the accident occurred; a seventh being added in the tabulation of the actions under the Employers' Liability Act for accidents in employments not covered by the 1897 Act. In the aggregate, the actions in County Courts under the Employers' Liability Act show a reduction from 681 cases in 1898 to 505 in 1899; while the damages awarded decreased from £16,853 to £10,680—a reduction of 36 per cent., as against 26 per cent. in the number of cases. From the sub-division into employments, it would appear that in mines the Workmen's Compensation Act has practically superseded the Employers' Liability Act, and in employment on railways has taken about half the cases; while in factories, quarries, buildings, and engineering works, the reduction in cases under the 1880 Act has been comparatively small, though nearly 80 per cent. of the actions brought under the 1897 Act relate to accidents incurred in these employments.

The average amount of compensation awarded in respect of fatal injuries under the Employers' Liability Act was about £115, as compared with £173 awarded under the Workmen's Compensation Act. The awards under the two Acts in respect of temporary incapacitation are not comparable. The average amount of solicitors' costs was £11 14s. 6d. under the new Act, as against £21 2s. 3d. under the Act of 1880.

The fourth table, showing the number of cases dealt with in the individual Courts, does not call for much comment. In England and Wales, the Bow County Court dealt with more claims than any other—a fact not surprising, when it is borne in mind that the Bow Court is situated in the heart of the East-end factory district, and has within its jurisdiction the Docks and other river-side industries of the Metropolis. So, in the case of Scotland, it is the factory-studded, shipping, and commercial city of Glasgow in whose Sheriff Court the greater number of cases are brought; the total under both Acts being, indeed, 50 per cent. higher than in the case of the Bow Court. There were 285 County Courts out of a total of 505 in England and Wales in which no case was brought under either Act. These would, of course, be in the agricultural districts principally.

To turn to the statistics as to appeals—of which so much is made in the Press by the enemies of the 1897 Act—we find that the number of cases carried to the Court of Appeal in England was 54, or only 4 per cent. of the actions brought before the County Courts. Of these appeals, 23 were brought by workmen —in 5 cases successfully—and 31 by employers, who were successful in as many as 12 cases. The appeals under the Employers' Liability Act numbered 21 in England and Wales. The figures for Scotland are: 51 cases under the 1880 Act, and 18 under the 1897 Act, carried to the Court of Session. The table of appeals under the Workmen's Compensation Act appended to the report is a very useful one; a brief note of the point in the Act on which the appeal arose being given where possible, while a reference is made in each case to the fullest available report of the proceedings. From this table, some idea can be formed of the provisions of the Act which have given rise to most litigation. Taking the English, Scotch, and Irish lists, there are 69 cases in which the point at issue is stated, including 11 which are noted as involving two points each. In 26 out of the 69 appeals, the question that arose was whether the workman's employment was one to which the Act applied. In 18 of these cases, its application to a factory was in dispute, in 5 its application to a building was questioned, while the 3 remaining cases had reference one to a railway and two to engineering works. In 13 instances the critical question was the meaning of the words "arising out of, and in the course of, his employment;" while, moreover, in five of these thirteen, as well as in two other cases, the meaning of the term "serious and wilful misconduct" was at issue. Six appeals turned on the question as to who are "dependants." The remaining cases arose out of various points in the Act—three as to the meaning of "personal injury by accident," two each as to those of "average weekly earnings" and "incapacity for work," and so forth.

The number of Medical Referees appointed under the Act at the end of last year, was 321. Their office may, however, be said to be practically a sinecure; only 43 references being made to them during the whole of 1899 by Judges, arbitrators, or committees. No figures are available as to the number of appeals by workmen to the referees under the first schedule (par. 11) of the Act; but the number is believed to have been very small. The proceedings of the Chief Registrar of Friendly Societies under the Act were noticed fully in the "JOURNAL" for the 31st ult.; and no further allusion to them is here necessary.

The returns relating to the working of the Acts in Scotland are remarkable for two special features. The first is the much larger amount of litigation entered into under both Acts in Scotland as compared with England. Taking as the basis of comparison the number of cases per million of population, the figures are: In England, 46 cases under the 1897, and 17 under the 1880 Act, as against 72 and 36 cases per million of the population respectively in Scotland. This disparity, says the report, is not easily to be accounted for, as, although it is true that private arbitrations are practically unknown in Scotland, there is no reason to believe that this method of settlement has been extensively adopted in England. The compiler of the report, however, we think, fails to attach sufficient importance to the large number of cases settled in the latter country by committees elected by the employers and their men. For while it is noted that in England 89 awards by committees were registered, the remark is added—as if to imply that such method of settlement was far from general—"but these came, as already noted, from four districts only." May not the inference be that it is the process of registration, rather than the method of settlement by committee, that is confined to the districts in question?

The second special feature in the Scotch returns is the small proportion of litigated cases in which the workman was successful. Under the Workmen's Compensation Act, the workman in England obtained definite judgment in his favour in 56 per cent., and the employer in 18 per cent., of the cases before the County Courts. In Scotland, the percentages were 34 in favour of the workman, and 28 in favour of the employer. It is probable that the difference is partly due to the larger number of cases settled in favour of the workman "out of Court;" but this does not fully explain the remarkable disparity between the statistics for the two countries—a disparity equally marked in the case of actions under the Employers' Liability Act.

As to the general conclusions to be drawn from the statistics given, the report observes truly that it would be a serious mistake to treat the cases which come before the County Courts as representing any considerable proportion of those in which compensation is claimed or paid under the Act. The great majority of claims are settled by agreement; only a small percentage being carried to formal arbitration. In the case of deaths, the claims are for considerable sums, and are therefore more frequently carried into Court. Nevertheless, out of a total of 2053 deaths from accidental injury sustained during employment in railways, factories, mines, and quarries during 1899, only 319 claims, or

about 15 per cent., were adjudicated upon in the County Courts. In regard to non-fatal injuries, no official figures are available which would give even a rough idea of the number of accidents coming within the scope of the Acts; but there are unofficial figures with regard to mines (supplied by some of the Miners' Relief Societies) from which it has been calculated with approximate accuracy that the total number of miners disabled during the year, for periods exceeding 14 days, is at least 70,000. The number of cases under both Acts, in which compensation was claimed by miners in the County Courts was only 130, equal to a percentage of 0·2, or one case for every 500 accidents. In other employments, where machinery for the automatic settlement of claims is less generally existent, the proportion of contested claims is doubtless higher; but there seems to be reason to think that the Home Office calculation, made before the Act came into force, that 150,000 accidents would annually fall within its scope, is too low rather than too high. Even at this figure, however, the proportion of litigated cases is less than 1 per cent.

THE TECHNOLOGY OF ACETYLENE.*

Our recent brief reference (p. 345) to Professor Lewes's new work on "Acetylene" indicated our appreciation of the manner in which author and publishers have united in an endeavour to place before the public a volume of goodly proportions on the technology of acetylene. We said enough then to show that the publishers have done their part in the preparation of the book extremely well. The type renders reading an agreeable task; and the side notes in red ink assist reference to the text. Professor Lewes is so well known to our readers as an authority on all matters connected with the acetylene and carbide industries that it is scarcely necessary for us to commend the successful manner in which he has dealt with his subject in this work, which, as he points out in the preface, is by far the most pretentious text-book on acetylene so far published in the English language.

The first chapter on "The History of Acetylene," from its discovery in 1836 by Edmund Davy to its commercial application about 1895, is interesting. The vexed question of the priority of the discovery of the production of calcium carbide by means of the electric furnace is discussed at considerable length. One interesting contribution to the controversy is a statement that in 1886 and 1887 lads employed in works where aluminium was made in electric furnaces "used often to amuse themselves in the dinner-hour by putting water on the old crucible linings and igniting the gas which was set free." If only one of these lads had submitted the old crucible linings to a distinguished savant, as later Mr. T. L. Wilson submitted his calcium carbide to Lord Kelvin, for investigation, the world would probably have had the benefits of lighting by acetylene some years before either Moissan, Willson, or Borchers announced his production of calcium carbide in the electric furnace! Professor Lewes prints the correspondence which passed between Mr. Willson and Lord Kelvin in the autumn of 1892, and finally comes to the conclusion that the world owes "commercial acetylene" to Mr. Willson and the shrewd business men who supported him.

It is now well recognized that Mr. Willson was really the first to foresee the immense commercial possibilities of acetylene obtained from calcium carbide; but it is equally clear that M. Moissan gave to the world the first explicit account of the formation of calcium carbide in the electric furnace. But to M. Moissan calcium carbide was only one of a series of products which his world-renowned researches with the electric furnace had revealed; and he investigated its properties with the same zeal and thoroughness as he bestowed on compounds of which the commercial value at present seems quite negligible. Thanks chiefly to M. Moissan's disinterested work, the manufacture of calcium carbide by means of the electric furnace can be pursued freely by anyone in almost all countries; while Willson, Bullier, and others sought only to secure patents which would have placed the control of carbide manufacture completely in their hands.

Professor Lewes clearly thinks Mr. Willson's claims to priority of the discovery of the method of producing calcium carbide in the electric furnace well substantiated, for throughout this book he refers to Mr. Willson with almost painful re-iteration as the "discoverer" of the method. He quotes at some length the evidence presented in opposition to Mr. Willson's application in 1896 for a Special Act of Parliament to antedate his English patent; but he omits to add the significant fact that the application was refused. Moreover Professor Lewes, in a list of carbide works at present running or in course of construction, fails to name any works in Great Britain except those at Foyers, which belong to the Company which acquired Willson's English patent rights. In respect of other countries, the list is a tolerably complete one; and we are surprised that works such as those at Blackburn and Cradley Heath, and those at present under construction in North Wales, are omitted from it. If the author's impartiality were not beyond question, these omissions would seem intentionally misleading.

The list of carbide works on pages 316-19 to which we have just referred happens to be one of the parts of the book where the proof-sheets appear to have escaped Professor Lewes's revision. Among numerous other errors in it (apart from the mere omission or misplacement of accents) we notice "sur la Rhone" for "sur le Rhône," "Kend" for "Lend," "Ing." for "Ind." (*i.e.*, industrie), "Lauffen-a-M" for "Lauffen-a-N." (*i.e.*, "Neckar"), "Société Electrochimie" for "Société electrochimique" and "Haur Gresivandan" for "Haut Grésivaudan;" while the polyglot expression "Electrochemische Works" is calculated to send a shiver through the least sensitive reader. In the Italian list we notice "Oberitalien" and "Distrikt"—words which are neither Italian nor good English; and "bei" seems out of place in the Norwegian list. English readers would also have recognized "Vienna," "Carinthia" and "Geneva" more easily if they had been so printed instead of appearing in German guise as "Wien," "Karnten" [Kärnten], and "Genf." We wonder if the works of 2000-horse power named under the heading "Russia" as "Hämeskosky Aktiebolag, Wiborg, Finland," is distinct from the 3000-horse power works given under the heading "Finland" as "Hamekoski Aktiebolag."

The second chapter is on the "Preparation of Acetylene," and is divided into five sections, of which the first four treat of methods of preparation of academical and scientific, rather than of technical, importance. The fifth section deals with the preparation by the interaction of carbides with water. A laboratory method for the preparation of "pure" acetylene is described. The purification of the gas which is evolved by dropping granules of carbide, a few at a time, into water, is effected by passing it through a wash-bottle containing a 3 per cent. solution of sodium hypochlorite, and through a tower containing moist sodium hydrate. Mr. Blagden's recent research (see "Journal," Vol. LXXV., p. 1718) on the action of acetylene on sodium hypochlorite indicates that purification by means of a solution of that salt causes contamination of the gas. This is objectionable, even though the gas is subsequently passed through sodium hydrate, as Professor Lewes recommends. The illustration given of the apparatus suitable for the production of pure acetylene by this method does not tally with the accompanying description. The carbide admission tube is shown terminating considerably above the tubulure which serves as the exit for the gas from the generating flask; whereas the description quite properly states that this tube should extend below the level of the tubulure.

The third chapter is on the "Properties of Acetylene," and is naturally one of the most important in the book. The heat of formation is given as a positive instead of a negative value—thus making acetylene appear to be an exothermic instead of an endothermic compound, as Professor Lewes afterwards correctly describes it. The degree of solubility of the gas in various liquids is given from the researches of a number of authorities; but, curiously enough, the values obtained by Dr. E. Müller in the Carlsruhe laboratory (see "Journal," Vol. LXXI., p. 1385) are not alluded to, though in the case of brine at least they differ appreciably from the figures recorded in this work. The most instructive series of researches on the explosive properties of gaseous and liquid acetylene, made by MM. Berthelot and Vieille, are described by liberal extracts from their original memoirs.

The fourth chapter treats of the "Chemical Reactions of Acetylene." The author's researches on the action of heat on acetylene are recorded, as are also the subsequent researches of Herren Haber and W. von Oechelhaeuser. The account given of the latter is virtually a reproduction, word for word, of large portions of the translation which appeared in the "Journal" of the German memoir (see "Journal," Vol. LXIX., pp. 349, 589), though we find no acknowledgment of this utilization of our columns. The continuity of the translation, however, is broken at two places by the omission by Professor Lewes of two passages in which damaging criticism is levelled against his observation of the decomposition of acetylene with luminescence, and his method of measuring temperatures. Later in the work before us, however, Professor Lewes attempts to explain the discrepancy between his own and Dr. Haber's observations on the occurrence of luminescence in the decomposition of acetylene. The compounds of acetylene with copper, silver, and other metals are discussed at great length, and voluminous extracts from the memoirs of their investigators are given. Then follows an account of Gréhant's and the other researches which go to prove that acetylene has but feeble toxic properties.

This concludes the chapter and Part I. of the book. This part is more especially devoted to the "scientific side of the preparation and properties of acetylene, while the second part deals with the technical developments of the last few years, considered from a scientific standpoint." From this and other statements in the preface, we understand that the second part is more particularly intended to enlighten and help the practical man engaged in the construction of generators or other acetylene plant. Certainly few men of this stamp would be greatly tempted to study closely the discursive disquisitions on the early history of acetylene and the academical researches of innumerable investigators. A summary of the matter in Part I., occupying not more than one-tenth the number of pages would have been more acceptable to the practical man, and if accompanied by references to the author's authorities would have equally well met the wants of nearly all others who are likely to use the work.

Chapter V., with which the second or more essentially practical

* "Acetylene, A Handbook for the Student and Manufacturer." By Vivian B. Lewes, F.I.C., &c., Professor of Chemistry, Royal Naval College, Greenwich, Chief Superintending Gas Examiner to the Corporation of the City of London, &c., &c. With 228 Illustrations. Westminster, Archibald Constable and Co., Limited; 1900.

part of the book commences, treats of the electric furnace. Almost immediately, however, the practical generator maker, or other reader, would find himself in difficulties in attempting to follow the author's remarks on the formation of carbides. The production of carbides by heating "the oxides of the alkaline earths" (*sic !*) with potassium is explained in the following lucid terms (p. 174): "All (*i.e.*, Wöhler, Travers, and Maquenne) produced carbides by making a mixture of the oxides of which the carbide was required with another metal having an affinity for oxygen, which, if the fusing point of the mass is attained, takes the oxygen from the oxide and sets it free in a condition favourable for its combination with carbon."

Really Professor Lewes must have underrated the intelligence of his readers to place before them such statements as, "oxides of earths," "carbide of oxides" and "oxygen which takes the oxygen from the oxide and sets it (oxygen ?) free." Incidentally, it may be observed that oxygen, whenever set free, is usually "in a condition favourable for its combination with carbon." The practical man may pass on, after he has assimilated such explanatory remarks, to the descriptions of a large number of electric furnaces, illustrations of nearly all of which are given. Strangely enough, there is no illustration of the furnaces used at the important works at Froges, near Grenoble, though later in the book, the author refers to the good quality of their output in these terms: "One of the purest carbides analyzed by the author was a run carbide from Froges" (p. 314). Readers of the work could better dispense with the figures of some of the obsolete and worthless furnaces than with a figure of the Froges type of furnace.

Chapter VI. is headed "The Manufacture, Properties, and Impurities of Calcium Carbide." We wonder what the practical man, who ought not to be expected to fill up the lacunæ in the author's sentences from his own scientific knowledge, will make of this passage, which occurs near the commencement of the chapter: "Some carbide makers lay great stress on the absence of sulphates from the lime; but, in the absence of aluminium, the presence of sulphates in small quantities is of no importance, as, unless aluminium sulphide is formed in the carbide, *it* will not find its way into the acetylene as sulphuretted hydrogen in any large quantity." The "it" which we have italicized doubtless is meant to refer to sulphur; but there is absolutely nothing in the sentence, or the context, to indicate this to the average "student and manufacturer" for whose assistance the work is intended. The amounts of ash, sulphur, and carbon in a number of samples of coke are stated shortly afterwards; but no indication of the origin of the samples is given, and as in a subsequent table of analyses of coke ash, samples of English origin are conspicuous by their absence, we wonder if this part of the book has any direct practical value to English manufacturers. In any case, it would have been more satisfactory to have had a statement of the origin of each sample of coke of which an analysis is given.

In the first line on p. 279, we find in connection with the use of briquettes of charcoal and lime, another "it" which appears to have no relation to anything before or after it; and we are quite at a loss in this instance even to guess the author's meaning. On p. 307 we are told that the smallest trace of carbon monoxide free in the air produces intense headache. If this were true, the workers in the Inner Circle railway tunnels of the Metropolis would be chronic sufferers; whereas in fact they enjoy the best of health. We see on p. 311 that the author informs his readers that the best method of utilizing the dust and smalls produced in breaking up the ingots of carbide is one devised by himself, and we are glad to be able to add that the seeming egotism is quite pardonable, as his method is both ingenious and very good. It consists in receiving the dust from the sieves in dehydrated tar, with which it forms a pasty mass, from which briquettes are moulded. The briquettes are heated to a temperature at which the volatile components of the tar distil off; and they are then sold for the generation of acetylene, of which they yield about 4 cubic feet per pound. We notice that at a works which is fortunate enough to secure coke at 12s. 6d. per ton (at the present time so low a price seems past hoping for) and lime at 12s. per ton, and water power at a rental of £2 per horse power per annum (1000-horse power being rented), Professor Lewes estimates the cost of one ton of packed carbide to be £8, which we believe agrees with earlier trustworthy estimates of the lowest probable cost of production. The various processes which have been proposed for the production of carbide without the aid of the electric furnace are considered; but Professor Lewes quite rightly regards them as unpromising.

The seventh chapter is on "The Generation of Acetylene;" and a large number of generators are described by the aid of illustrations. The majority of these were exhibited at the Acetylene Exhibition at the Imperial Institute in 1898, and were critically discussed in our columns at the time. We notice that Professor Lewes no longer divides acetylene generators into three classes, as he was formerly wont to do, but speaks only of the two main types which are distinguished by whether it is the carbide or the water which is in excess during the operation. It is, of course, convenient to make subdivisions of the generators of each of these primary types; and Professor Lewes follows this plan in the work before us. He speaks of an installation of acetylene lighting at the Wolverton station of the Great Eastern railway. Evidently there is a misprint here. Wolverton, as nearly all our readers will remember, is an important station and works on the London and North-Western Company's system, while it is Wolferton which is a small station on the Great Eastern Railway. When discussing the heat evolved in different types of generators, Professor Lewes makes long quotations from a paper by Dr. Caro, of Berlin, of which we gave an abstract translation (see "JOURNAL," Vol. LXXI., p. 1380). Our translation is not referred to in connection with these quotations; but, nevertheless, they are almost absolutely identical in wording, and it is impossible that any two translators would not have displayed some differences in the style of their compositions or choice of words in rendering such long passages into English. A few pages later Professor Lewes gives a list of acetylene supply works at present in operation or under construction. This list is identical with that given in the "JOURNAL" for Dec. 5 last (p. 1374), with the exception that the statistics with regard to one town are slightly varied. The list as it is given by Professor Lewes could not have been derived from any source but our columns; but no acknowledgment is made by him of his indebtedness to us. Throughout the book the "JOURNAL" columns have been freely drawn upon, *without acknowledgment*, while other technical and scientific periodicals are named when quotations are made from them.

The eighth chapter deals with the "Impurities of Commercial Acetylene" and the purification of the gas. Here also we find extensive extracts from Dr. Caro's writings (see "JOURNAL" Vol. LXXIV., p. 940); but in this case we are glad to say the translation given is not ours, which was evidently too much summarized for the author's taste. There appears to be no great amount of original matter in this chapter, which is followed by the important one in which the "Generation of Light and Power from Acetylene" is dealt with. Here we are pleased to note that Professor Lewes at once disposes of the contention of acetylene enthusiasts that the gas is "fifteen times as valuable in illuminating power, volume for volume, as London coal gas." Numerous types of acetylene burners are described, and then we find some comments on the statutory illuminating power of coal gas. That this expresses the amount of illumination to be obtained under ordinary circumstances from the gas, was, the author says, the belief of most people up to a few years ago. "This assumption, however," he continues, "is far from correct, and has given rise to a chaotic bemuddlement in the theory and practice of illumination." The forcible, if none too elegant, expression "chaotic bemuddlement" might be applied aptly to the notions of many would-be legislators on the illuminating power of London gas. Professor Lewes afterwards expresses the opinion that a screened acetylene-jet flame would make an excellent international photometrical unit.

Chapter X. is on "The Utilization of Diluted Acetylene." The most valuable part of it is that which treats of the use of mixtures of oil gas or coal gas and acetylene for railway carriage lighting. The experiments made by Messrs. Pintsch and by Herr Borck on the explosiveness of such mixtures are recorded fully, and the results are tabulated.

Chapter XI. is on the analysis of the raw materials, and of carbide and acetylene.

We then come to Part III. of the work, which comprises three sections. The first gives in full the legal enactments of various countries with regard to carbide and acetylene. These should prove useful for reference to manufacturers, dealers, and exporters. The second section is a list of English patents granted for acetylene generators and lamps, with abstracts of the specifications. It occupies 147 pages. Professor Lewes earlier in the work states that "at the present time, in England alone, some 300 forms of acetylene generators have been patented. About 60 of these have been actually made, and half that number have attained to the dignity of being on sale." In view of this comment, we wonder why he considered it necessary to encumber his textbook with abstracts of all these patent specifications, especially when abstracts can be found in our columns and in those of some other readily accessible periodicals, by those who really find it necessary to make a search. A list merely of the numbers, titles, and patentees' names would have served every useful purpose; and the book would have been the better for the saving in pages. The third section of Part III. is an appendix of useful data. An index of 30 pages concludes this voluminous work, which we should have read with greater pleasure had its bulk been reduced by the omission of many tedious extracts from the writings of other authorities. Professor Lewes is fully competent to work the matter contained in these extracts into a homogeneous and harmonious whole with his own valuable contributions; and we are decidedly of opinion that the book would have been much improved had he followed this course.

The Institution of Gas Engineers and the International Gas Congress.—We hear that several members, who, in answer to the first circular issued by the Council of the Institution of Gas Engineers, signified their intention of joining the party attending the International Gas Congress in Paris, have not yet returned their application forms. It will greatly assist the Secretary if they will do so without delay. There may also possibly be other members who, at the time of sending in their reply to the first circular, could not see their way clear to visit Paris but who could now, under altered circumstances, accompany the party. If there are any such members, they should at once place themselves in communication with the Secretary.

PERSONAL.

Mr. R. Hesketh Jones has been elected a Director of the Bournemouth Gas and Water Company.

Mr. T. B. Pearson, Secretary of the Pontypool Gas and Water Company, has been appointed Manager, in succession to the late Colonel Hair, and will fill the combined positions.

Mr. F. W. Torpey, who has relinquished the position of Manager of the Whitwick and Coalville Gas Company, took up yesterday his duties as Manager of the St. Ives (Hunts) Gas-Works.

Mr. S. J. Symonds, assistant at the Hertford Gas-Works, has been appointed, out of 60 applicants, Manager and Secretary of the Farnham Gas Company, in succession to Mr. William Wells, who has resigned after 42 years' service.

Alderman Lloyd Higginbottom, of Manchester, has consented to accept the Lord Mayoralty. He has been Deputy-Chairman of the Corporation Gas Committee, and is doing good service as Chairman of the Electricity Committee.

Mr. Harry Wimhurst, son of Mr. H. Wimhurst, of Sleaford, who for some time has been engaged with the Elland-cum-Greetland Gas Company, has secured the appointment of Manager and Secretary of the Irthlingborough (Northamptonshire) Gas Company.

The American University of Harriman (Tenn.) has granted the degree of Doctor of Philosophy (Ph.D.), *pro meritorius*, to Mr. J. T. Westcott, M.E., Manager of the Economical Gas Apparatus Construction Company, Limited. The qualifications were chiefly mathematics and engineering.

Acting upon medical advice, Alderman Hugh Bell, of Middlesbrough, has resigned his position as Chairman of the Corporation Gas Committee; having been recommended to curtail his public engagements. Mr. Bell, who was appointed to the chairmanship of the Committee in 1885, is to be asked to reconsider his decision.

Mr. W. H. G. Padfield, B.A., has been offered and accepted the Examinership in Mathematics at the Punjab University, in addition to his present appointment. Out of a total of eight scholarships for civil engineering and electricity, available for the whole of India, six of these were won by pupils prepared by him at La Martinère College, Lucknow.

NOTES.

Action of Iron on Water.

Writing on this subject in the "Chemical News," Mr. W. French, of the Bury Grammar School, calls attention to the fact, which seems to him astonishing, that modern standard text-books on chemistry do not mention the fact of the readiness with which iron decomposes water at ordinary temperatures, with evolution of hydrogen gas. He says that in the elementary work at the school, when studying the effect of water on metals, it is always a source of much interest to observe from day to day the continued effect of water on the commoner metals. In the case of iron, when a test-tube of filings is covered with water, "red-rust" first occurs on the surface, and then beneath this rust appears the greenish-black oxide in a flocculent form, and finally bubbles of hydrogen. By suitably arranging an apparatus, a volume of gas may be collected in two weeks, using iron filings, or in a few hours if *ferrum reductum* (B.P.) is used, sufficient to demonstrate its properties. The same is true if zinc dust is employed. He finds that distilled water, recently boiled and cooled, shows an evolution of hydrogen sooner than common water; and no trace of red rust is observed if air is excluded.

The Flow of Marble.

According to a paper by Professor Frank D. Adams, of Manchester, contributed to the Royal Society, rocks are as unstable under severe physical stress as metals and gases have long been known to be. Very little, therefore, remains on the earth of the old rigid materials and elements which were supposed to be permanent in form or substance. In Professor Adams's experiments, solid marble was made to flow like wax under the pressure of a hydraulic intensifying press, or like iron under the rolls. In both cases the motion is facilitated by the application of heat. It is unnecessary to describe the experiments in detail; but they showed that limestone or marble can be permanently deformed by pressure under certain conditions. The movement is identical with that produced in metals by squeezing or hammering. There is, therefore, a flow of marble just as there is a flow of metals, under suitable conditions of pressure. The movement is also identical with that seen in glacial ice. In these experiments the presence of water was not observed to exert any influence. It is believed, from the result of other experiments now being carried out, but not yet completed, that similar movements can, to a certain extent at least, be induced in granite and other harder crystalline rocks. The result of movements of this character are visible all over the world in the distorted crystalline strata which have attracted the attention and speculation of the earliest geologists; but this is the first time that rocks have actually been caused to flow artificially by human agency, and the result is all the more striking. The marble was not broken up in the process of squeezing; samples that had altered in shape under the strain being found actually stronger than those unstressed. It would be curious to try the same experiment on coal.

The Flow of Hot Water in Pipes.

An interesting experiment has been carried out by Mr. H. T. Yaryan, in connection with the hot-water heating central station at Toledo, United States. It appeared that when this undertaking was started, it was found necessary to know the relative friction of hot water in pipes as compared with cold; and there were no available data in regard to this point, which could be used in calculating the size of mains required for the supply of a given number of houses. Consequently the question was determined experimentally. A run of 450 feet of 1-inch pipe was laid down, with numerous bends, and was connected with a meter. With a constant pressure of 10 lbs., it was found that the delivery at the end of the pipe in five minutes was 6·2 cubic feet at 34° Fahr., rising to 7·9 cubic feet at 212° Fahr. As it required an average of 15 gallons per minute to be delivered to each house, and the friction of cold water in pipes was known, the data thus obtained enabled the engineer to calculate the size of mains necessary to give good service to each house, and always maintain a sufficient difference in pressure between feed and return mains to ensure rapid circulation. It transpired that in this case, the extreme length of distributing mains being three-fourths of a mile from the station, the water returns to the station with a drop of 35° Fahr. in the coldest weather. The general suitability of the method of distributing heat adopted in this example has been denied; but in certain circumstances it appears to be as successful as it certainly is convenient.

The Occlusion of Hydrogen by Metals.

In the course of his address to the American Association for the Advancement of Science, Professor J. L. Howe discussed the phenomenon exhibited by several of the eighth group of metals (and particularly by palladium), of condensing hydrogen and other gases upon their surface. The discovery that platinum black and platinum sponge, when held in a stream of hydrogen, ignite the gas, owing to the absorption of the hydrogen by the platinum, was made by Döbereiner in 1823. Little attention, however, had been paid to the similar action of palladium upon combustible gases, until Graham in 1868 presented to the Royal Society his paper on the occlusion of hydrogen by metals. His interpretation of the phenomena is that hydrogen is a metal, and forms an alloy with the metal which occludes it; but this view was received with considerable dissent. The recent determinations of the specific gravity of liquid hydrogen by Dewar show a figure only of about one-ninth of the density of occluded hydrogen, so that the question of the nature of the hydrogen condensed by the palladium and platinum remains unsettled. The other metals of the group in the periodic system possess this property to some considerable degree, but much less than is the case with palladium and platinum. One of the earliest papers of Dewar was on the motion of a palladium plate, during the formation of Graham's hydrogenium. This paper was contributed to the Royal Society of Edinburgh in 1869. Nothing more seems to be known concerning the nature or causes of the phenomenon in question; and no modern papers relating to it are included in the proceedings of learned societies of any country. Professor Howe was content to touch upon the fact in passing, without attempting to explain it.

The Problem of Tin.

One of the indispensable supplies for gas-works is tin, in several forms; and this metal has exactly doubled in price in two years. It is remarked in a special article on the "Problem of Tin," published in "Engineering," that tin actually presents an economical aspect difficult to reconcile with the usual platitudes about the interaction between supply and demand. For several years past, there has been an excess of market deliveries over supplies; the amount of the dip into stocks being 17,512 tons in three years. The only comfort is that the balance on the wrong side shows a decrease each year. But that is a very negative sort of consolation; the main fact which the unfortunate consumer of tin has to grasp being that his demands still keep well ahead of production, notwithstanding the heavy advance in the price. There is no tin famine to account for this shortage of market supplies, and much of the metal comes from small producers. Yet the anomalous feature of the situation is unrelieved, and the mining industry has utterly failed to respond to the stimulus afforded by an extra £70 per ton profit on the raw metal. The average annual supplies for the three years ending June, 1898, reached 62,360 tons, although the price never exceeded £70 10s. per ton. For the last two years, the annual average works out at 62,431 tons, though the price has touched £150 per ton. Even if it might be supposed that the big producers would not be disinclined to nurse so good a market, the small producers might be expected to weigh in as much as they could while the prices ruled so stiff; but this does not appear to have been done. It is reported, however, that New South Wales is making great efforts to take advantage of the present opportunity, and supplies sufficient to satisfy the market may flow in just as the best prices begin to slacken. Then the price of tin may fall by £30 or £40 per ton; but meanwhile consumers have to buy it at an exorbitant rate.

TECHNICAL RECORD.

THE INTERNATIONAL GAS CONGRESS IN PARIS.

List of Papers to be Read.

We are now enabled to give a complete list of the papers to be read at the forthcoming International Gas Congress, of which mention was briefly made in the "Journal" last week. The names of the authors and the titles of their communications appear in the order of the programme of questions proposed some time back for discussion. Some of these papers have already been printed for circulation among those who intend to be present at the congress, while the other communications, not received in time, will only appear after the meetings have been held. The list is as follows:—

"Inclined Retorts." By Mr. C. E. Brackenbury, of London.

"Mechanical Means of Dealing with Coke in the Works of the Paris Gas Company." Report by M. Louvel, of the Paris Gas Company.

"Coal-Handling Plant." By Mr. F. D. Marshall, of Copenhagen.

"Notes on a Retort-Bench with Independent Producers at a Distance." By M. G. Eichelbrenner, of Paris.

"On the Measurement of High Temperatures." By Mr. Alten S. Miller, of New York.

"Thermic Reactions during the Carbonization of Coal. Registering of High Temperatures. Details of Experiments." Report by M. Euchène, of the Paris Gas Company.

"On the Absorption of Hydrocyanic Acid by Illuminating Gas, as an Introduction to the Question: What Progress has been made in the Manufacture of Gas in respect of the Production, by Liquid Process, of Yellow Prussiate of Potassium?" By Dr. A. Smits, of Amsterdam

"Production and Manufacture of Cyanides in Gas-Works." By Dr. J. Bueb, of Dessau.

"Carburetted Water Gas: Its Use in Coal-Gas Works." By M. Henri Sospizio, of Trieste.

"Means to be Adopted for Avoiding Naphthalene Obstructions." By Dr. J. Bueb.

"In What Way the Normal Loss of Gas in Distribution may be Reduced to the Greatest Extent." By Mr. P. H. Gibbons, of Philadelphia.

"Gas-Engines and their Gas Supply." M. Aimé Witz, of Lille.

"Reduction in the Cost of Distribution by the Adoption of High Pressures." By Mr. F. H. Shelton, of Philadelphia.

"Concerning Consumers' Meters." Opening of a Discussion on Wet and Dry Meters. By M. Bigeard, of Angers.

"Advantages and Disadvantages of Dry Meters." By M. G. Asselbergs, of Bergen-op-Zoom.

"Results obtained in Holland with Prepayment Meters." By M. P. Bolsius, of Bois-le-Duc.

"Report on the Utility of Standardizing the Pitch of Screws for Gas-Fittings." By M. J. Bengel, of Paris.

"The Photometry of Incandescent Gas." By Dr. H. Bunte, of Carlsruhe.

"Draft of Conditions and Rules to be observed in the Photometry of Incandescent Gas-Mantles." By MM. Stœcklin, Rieder, and Co., of Mulhouse.

"Heating and Cooking by Gas." Report by M. A. Lévy, of the Paris Gas Company.

"Statistics of Swiss Gas-Works. Diagrams and Plans of the Gas Consumption and Town of Zurich, 1890-1899. Plan of the Gas-Works of Winterthur and Geneva." By La Société Technique Suisse des Directeurs de Gaz et Eaux.

"Notes on the Public Lighting Arrangements of Guayaquil." By M. Charles Guichard, of Paris.

"Comparison between the Usual Illuminants by means of Diagrams." By M. Ad. Bouvier, of Lyons.

"Automatic Lighting and Extinguishing of Gas in High Street-Lamps." By M. F. Kœnig, of Berlin.

"Examination of the Competitive Illuminants of Gas." By M. A. Lecomte, of Paris.

"La Lumière Globe." By M. Ernst Salzenberg, of Crefeld.

"Means of Interesting Stokers in Retort-House Work." By M. I. Hedde, of Paris.

"The History, Character, and Results of the Educational Fund Instituted by the American Gaslight Association for the Technical Instruction of Gas Workers." By Mr. Alfred E. Forstall, of New York.

It will be seen from the above that a large amount of ground is covered by the subjects chosen, and many of the papers offer considerable opportunities for the exchange of international ideas, which may be not only of passing interest, but also of some permanent use generally to the gas industry.

NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Sligo.

The Annual Meeting of the above-named Association was held in the Town Hall, Sligo, last Tuesday—Mr. C. B. Tully, Engineer and Secretary of the Sligo Gas Company, the President for the year, in the chair. There was a fairly large attendance.

The Report of the Committee.

The Hon. Secretary (Mr. J. Whimster, of Armagh) submitted the report of the Committee. It opened with an expression of regret at the loss by death of two of the extraordinary members—Mr. J. Bain, of Glasgow, and Mr. C. S. Spear, of Dublin—to whose memory a fitting tribute was paid for their geniality and hospitality. Reference was made to the difficulty experienced in getting papers for the meeting; but the Committee hoped that the inspection of plant for which arrangements had been made would prove as interesting and instructive as literary contributions. After the programme was issued, however, two papers were promised. The Committee trusted the proposal to change the name of the Association would elicit a frank expression of opinion from the members. The Association now possesses 64 ordinary, 24 extraordinary, and 2 honorary members; making a total of 90. The accounts accompanying the report showed that the income for the year was £60 16s. 11d.; and that the balance in hand at the close was £33 7s. 5d. The subscription on behalf of the widow and family of the late Mr. P. J. Salmon amounted to £13 3s. Details were appended to the financial statement.

The report and accounts were adopted.

President's Address.

The President then delivered the following

INAUGURAL ADDRESS.

In addressing to you a few remarks on the position and prospects of our Association, and the business with which it is most intimately concerned, I conceive it to be my first duty to return you my sincere thanks for the honour you conferred on me in electing me President of your Association for the year which has now drawn to a close. My next duty is to welcome you as representatives of a most important industry to the most important and promising centre of trade in the West of Ireland, the town of Sligo; for I need not point out to you that the railway and shipping accommodation of Sligo are such as necessarily place it in a favourable position for trade and traffic. In this connection, I cannot help referring with regret to the lamented death of the late Mr. C. S. Spear, who was our genial host at our annual conference in Dublin last year, and whose unexpected death we all deplore sincerely. We also miss another old friend of the Association in the late Mr. John Bain, who was so well known to us all.

With regard to our Association, it is satisfactory to be able to announce that there has been a considerable increase in the list of members during the year; and I think we may look forward to a still greater increase in the near future. This is eminently satisfactory; for it is only by intelligent co-operation and combination, and comparing notes, so to speak, between those whose circumstances and surroundings are obviously different in different localities, that a clear conception can be formed of the lines along which general progress lies. I may say here that the remarks and suggestions I have to make are intended chiefly for the smaller gas-works, such as we have in the provincial towns of Ireland.

One of the most serious questions with which all of us have had to deal during the past year is the advance in the price of coal. I think, however, that the seriousness of this matter has been considerably over-estimated. In the first place, we have a partial set-off in the increased price of coke and other marketable residuals. Again, in accordance with the adage that "Necessity is the Mother of Invention," there is a material benefit to be derived from the efforts we are obliged to make to meet the extra cost; and I am sure, by putting our energies to work and adopting some of the modern ideas of gas manufacture and distribution, we can all do something to counteract the excessive cost of coals. For my own part, I have endeavoured with fair success to do this—(1) By perfecting the retort settings. (2) By the adoption of machinery for charging the retorts. (3) By the introduction of a carburetting plant for enriching the gas and obviating the necessity for using cannel coal for this purpose.

I was surprised to find, during my travels last summer, two towns, at least, in Ireland where iron retorts were, and are still, in use—one town with a population of over 4000 inhabitants. Surely it is time that these were superseded by clay retorts. The saying, "Money is Made in the Retort-House," is more applicable than ever; and capital spent on good settings will very soon repay itself. Expensive systems of regeneration are unnecessary; but a cheap form of shallow generator, with a secondary air supply, which could be adapted to the smallest works, will give very satisfactory results. Most makers of retorts supply working drawings on application; and any intelligent man accustomed to the work would find no more difficulty in building a generator furnace and setting than the direct-

fired setting. Of the many advantages to be derived from the adoption of this system, one of the most important is that the hot coke can be drawn directly into the furnace after clinkering, and a great saving of heat thus obtained.

It is impossible to get additional men during the heavy season to do the same amount of work, and with as good results, as the constant, regular men; and we have invariably had to work during the winter season with raw hands, with the result that the make per mouthpiece falls off, and the consumption of coke per ton of coal increases. To overcome this difficulty, I have adopted Messrs. Biggs, Wall, and Co.'s "Rapid" charging-machine; and from what I have seen of its working, I expect to get at least 50 per cent. more coal carbonized per mouthpiece during the winter, which will result in a corresponding increase in coke sold per ton. Besides, we shall not be depending upon skilled shovel chargers, and shall have a larger scope for the selection of men. I am not so anxious to economize wages as to obtain good results in manufacture.

It had been the practice in Sligo for some few years to enrich the gas during lighting hours up to 16 to 16½ candles with cannel, and to send out gas during the day of about 15 candles. This arrangement was uncertain, and sometimes unsatisfactory; so last summer a small carburettor was fixed at the station governor, and cannel dispensed with. The first day's trial proved the value of this arrangement; the apparatus being switched on half-an-hour before sunset and worked until 11 p.m. The gas during that time was enriched up to 18 to 18½ candles, costing 2s. 6d. per day, and replacing 1 ton of cannel. The apparatus is working with such satisfactory and certain results that I should be very sorry to dispense with it. The anxiety as to the illuminating power of the gas in the retort-house is a thing of the past.

Too much importance cannot be attached to the washing of the gas and the thorough removal of the ammonia. I am sorry to say many works I know make no attempt to remove this impurity, with the result that their meters and fittings are destroyed in a very short time. At a meter-works some few months ago, I happened to notice a dry meter smothered with tar; and I naturally asked where it came from. I was informed Ireland; and my informant told me that they got a great number from Ireland in that condition, and they only lasted a very few years. Now this is a state of things that should not exist, and could be remedied at a very small expenditure.

An exhauster driven by a gas-engine, with a small pump attached, for circulating the ammoniacal liquor for washing the gas, could be adopted with advantage and profit at most small gas-works. Any capital expended in this direction will repay itself in a very short time.

I did not intend to go into the details of the purification of gas, &c., but I am aware that at many works the purifying plant is hopelessly small. The system I adopt is to use lime in the first of the series of purifiers, and oxide in the remainder. The gas entering the first purifier contains both carbonic acid and sulphuretted hydrogen, and these gases at first combine with the lime; but the lime having more affinity for carbonic acid than sulphuretted hydrogen, the sulphuretted hydrogen is gradually being replaced and driven forward to the oxide purifiers, thus enabling the lime to be completely converted into carbonate, which can be tested by simply bubbling the gas through lime water for a minute. If carbonic acid is present, the lime water will become cloudy. Fortunately, none of us are worried with the removal of other sulphur compounds.

As water gas is at present making great headway on the Continent and in this country, no doubt in the near future it will form a very important addition to our business. Some time ago I went into the subject, and decided, with Professor Lewes's consent, to construct one of his methane hydrogen water-gas generators, capable of making 50,000 cubic feet per day. It is possible with this plant to make methane hydrogen water gas, carburetted water gas, or straight water gas at will. It is intended mixing this gas with the coal gas at the outlet of the hydraulic main, with a view to picking up any light hydrocarbon, and passing it on to the gasholders, and enriching it up to 18 candles or so at the station governor, by means of a carburettor using benzol or light naphtha. My reasons for adopting Professor Lewes's plant were owing to the similarity of the gas to ordinary coal gas, and to the fact that it contains only half the quantity of carbon monoxide; and the fact of the methane hydrogen water gas being a particularly good diluent for acetylene, also holds good for benzol or naphtha. It can be started at an hour's notice; and will enable us to fill up the holders at any time, and obviate the necessity for curtailing the supply or lighting up beds of retorts. We can also use up our coke when the demand is bad, and so maintain a steady price. At present, petroleum is being used in the plant; but at an early date it is proposed to erect a small tar plant to distil our own tar (and any obtained from the neighbouring works) for light naphtha, oils, and pitch—the naphtha being used for carburetting, the oils for the water gas, and the pitch being sold, for which there is a good demand at high prices. I have been engaged for some time experimenting with peat for various purposes; and from results so far obtained, I am confident that a generator could be designed to utilize this abundant source of carbon, instead of importing coal for the purpose.

Unaccounted-for gas has been always a fruitful source of annoyance to all of us. This may be caused by leaky mains, decayed services, neglect to water meters, and public lighting. When I took charge in Sligo, the unaccounted-for gas was 60 per cent. The gas was shut off during the daytime, with the result that the lamplighters saved themselves the trouble of turning off the lamps. Consequently the mains got full of air, and the services laid, and the gas-fitting done, were not tested; so, naturally, leakage increased.

As we are not afflicted with expensive wood pavement or asphalte, but only common macadam, I decided that the cheapest and most certain and satisfactory mode of curing the leakage was to open up the mains and services. Contracts were let for stripping the mains and filling in and ramming the trench, at 1s. 3d. per perch (7 yards); and for laying, leading, and caulking 3-inch to 6-inch pipes, 2s. 6d. per perch. The mains were found to be broken in several places, especially over sewers, and many joints were found uncaulked and leaking at the bottoms. Most of the services were decayed and leaking; and in several cases as many as three services were found in one house. I maintain that this is the cheapest and only satisfactory method of remedying a serious case of leakage. Having reduced the leakage, the next step is to try and sell the gas thus saved; and I believe you all have as much scope as myself, and I am satisfied that there is still a large undeveloped field in Sligo.

My experience of the adoption of the slot meter in Sligo is most satisfactory. Out of a total of 770 meters in use, we have 150 slot meters, 64 of which have cookers attached. The average consumption is 11,300 cubic feet for all—9000 feet for lighting only, and 13,000 feet where a cooker is attached. The average amount received per meter is £2 10s. 10d. On looking up these figures, I was more than pleased to find that the consumption of gas during the two summer quarters, with cookers attached, is about 25 per cent. in excess of the winter consumption, which has led me to the conclusion that we should push the cooker with the slot meter. The average cost of fitting a slot-meter installation, including service and cooker, is £6, and without cooker £4 7s.

Since the reduction in the price of the Welsbach burner and mantle, we have decided to supply them free of charge to slot-meter consumers in lieu of the governor burner, and expect to have a very great increase of consumers on this account. The meters are at present rated at 15 feet for a penny, and a minimum consumption of 6448 cubic feet per annum arranged, divided over twelve months. Then, 25 per cent. rebate is allowed on all gas consumed over the minimum consumption assumed to be stove gas. This arrangement gets over the difficulty of different rating of meters, &c.

In England, the gas consumed per thousand of the population amounts to about 4½ million cubic feet. In Ireland, it is on the average only about half-a-million, and in some towns as low as a quarter-of-a-million. In Sligo, however, it amounts to 2½ million cubic feet. It is thus clear that there is in this country plenty of scope for energy and enterprise in the development of the industry. Blame for our comparative backwardness in this respect lies more with the directors of companies than with the managers. In many instances they have not increased the capital with which they started 40 or 50 years ago; and it is therefore impossible for them to develop their business in accordance with modern requirements. Some companies have built up large reserve funds, but have not turned the money to account. I am convinced from experience that the money invested by such companies in (say) 3½ per cent. Consols, would, if employed in the development and extension of their own business, yield at least 15 per cent. By reducing the selling price of gas used for cooking, heating, and motive power, and by supplying consumers with all kinds of fittings—engines, stoves, and in fact anything that consumes gas—on an easy hire-purchase system, the output could, I am confident, be easily doubled, and consumers would be induced to fit up their premises in a far better style, and with more satisfactory results. The extra gas thus demanded could be produced by most small companies without any addition to the standing expenses—salaries, rents, rates, taxes, &c.—while the loss from leakage would remain also unincreased. The additional gas used by these means would be chiefly consumed in the daytime, leaving the retorts available for lighting purposes at night. This would level up the load and obviate the necessity for extra holder room.

Considering that, in addition to lighting, gas is now so extensively used as a motive power, it must be conceded that the manufacture and distribution of gas constitute an industry of great and growing importance. And with a view to the development of manufacturing industries in Ireland, it is essential that the existing and necessary industries should be encouraged as much as possible by supplying them on the most moderate terms practicable with gas for power and manufacturing purposes, considering that gas now plays such an important part in almost all manufacturing operations. It is in this way that gas companies may help to utilize to advantage the many natural industrial resources of a country which, in the past, has been scandalously neglected in this respect.

A vote of thanks was accorded to the President.

The Name of the Association.

Mr. F. Eustace (Tullamore) moved "That the name of the Association be changed from the present name to that of the Irish Association of Gas Managers." He said he thought it

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SIZES.

Outside over all . 31 in. high . 17 in. wide . 16 in. deep.

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Two Burners on Hot-Plate, One Reversible Grill-Burner, and One Boiling-Burner.

Fitted with Patent Removable Enamelled Linings, and Removable Enamelled Tray.

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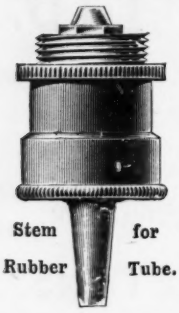
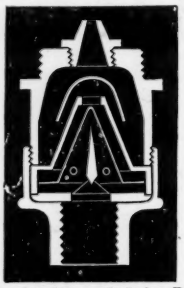


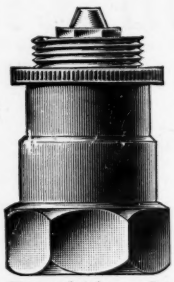
Stem Rubber for Tube.

Requires only $\frac{3}{10}$ths higher pressure than is necessary to pass the Gas through Nipple without a Governor.



Tapped $\frac{3}{8}$ in. and $\frac{7}{16}$ in. Brass.

Most Satisfactory and RELIABLE GOVERNOR on the Market.



Hexagon Tapped $\frac{3}{8}$ in. and $\frac{1}{2}$ in. Iron.

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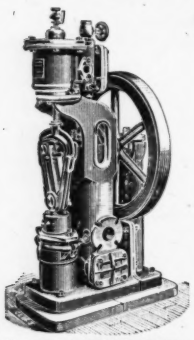

Fig. 709. "SINGLE RAM" STEAM-PUMP.

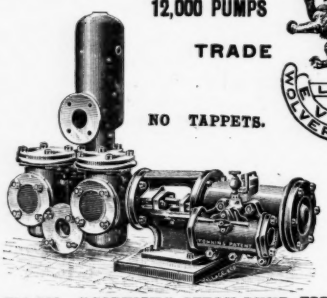

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

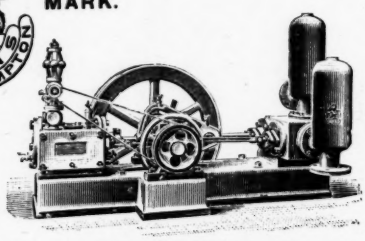

Fig. 688. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

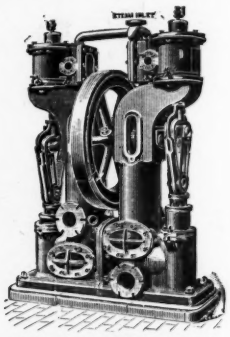

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

A NEEDFUL NOTICE

TO ALL WHOM IT MAY CONCERN.

We hereby intimate to Chairmen and Members of Gas Committees, Engineers and Managers of Gas-Works, that we have PURCHASED THE BUSINESS AND PATENTS OF THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, Westminster, London, and are now the Sole Owners of the Patents of the pre-eminently successful system of Self-Acting Conveyors and Elevators in combination with the Storage Hoppers, the Measuring Chambers, and the Charging-Shoots, forming together the much admired and happily-designated "powder-pouch" method of charging Inclined Retorts, now in operation, or in course of erection, at—

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Bow Common,	**Coventry,**	**Manchester,**	**Smethwick,**
Brentford,	**Dewsbury,**	**Middlesbrough,**	**Todmorden,**
Brighouse,	**Dudley,**	**Middleton,**	**Wakefield,**
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NEW CONVEYOR CO., LTD., SMETHWICK.

would be a great benefit to the Association to alter the name as proposed, because it would be a means of increasing the membership. There were, he was sure, many southern managers who would be willing to join the Association if they saw that it was a national one. He believed his suggestion would meet with their approbation.

Mr. S. B. LANGLANDS (Coleraine) said he had much pleasure in seconding the proposal. In the present state of matters, he thought the limitation had a weakening effect, because quite a number of gas managers in Ireland would, he knew, join them if a bigger name were given to the Association. Then, again, they might take it that any person aspiring to the office of President, which was being so worthily filled by Mr. Tully that day, would feel it a greater honour to preside over a general than over a provincial Association. Further, why should not the brotherhood of gas managership in Ireland be fostered? Why should they not join hands? In increased numbers they would have greater strength. He hoped there would be unanimity in the movement. He might mention that a letter had been received from a manager in the North of Ireland, in which he said that but for the limitation he would have joined the Association and been one of the working members long ago.

There was no counter-proposal, and the motion was carried unanimously.

The PRESIDENT hoped this movement would open up a new future for the Association. He himself was quite confident that it would.

NEW MEMBERS.

The following were elected members of the Association:—

Ordinary Members.—Airth, G., Dundalk; Bradley, John, Athlone; Brown, Frank, Tuam; Byron, R. H., Nenagh; Cronin, John, Middleton (Co. Cork); Davis, J., Naas; Dickson, John H., Ballycastle (Co. Antrim); Donegan, L., Drogheda; Lusted, J. A., Ennis; Lyne, J., Wexford; Lyne, J. J., Enniscorthy; Parsons, H., Mullingar; Tooms, D. W., Carrick-on-Suir; Young, L. G., Athy.

Extra-Ordinary Members.—Duff, C. N., Glasgow; Magill, Edwin, Glasgow; Marsh, T., Manchester; Scrivener, S. A., Dublin; Wall, J. W. R., London.

The PRESIDENT said he must remark that this was a very satisfactory commencement to the new Association—or rather to the old Association under a new name.

ELECTION OF OFFICE-BEARERS.

Mr. EUSTACE said he had great pleasure in proposing that Mr. W. A. Reid, of Longford, be elected President for the ensuing year.

Mr. LANGLANDS seconded the proposition, and it was agreed to.

Mr. T. WHIMSTER (Omagh) moved, and Mr. A. MACKENZIE (Edinburgh) seconded, that Mr. S. B. Langlands be elected Vice-President. This was agreed to.

Mr. F. J. Clarke, of Ballinasloe, Mr. P. Conray, of Galway, and Mr. T. Whimster, of Omagh, were elected members of Committee, on the motion of Mr. W. A. REID, seconded by Mr. S. A. SCRIVENER.

Mr. LANGLANDS said he did not think the post of Secretary should be put to the meeting at all, because he regarded Mr. Whimster as one of the fixtures of the Association, and he thought they should hold him to be permanent Secretary.

The PRESIDENT thought it was unnecessary to put any motion on the subject to the meeting. They certainly recognized Mr. Whimster as one of the fixtures of the Association.

The appointment was agreed to.

Mr. P. HURLL (Glasgow) jocularly remarked that he thought the appointment should be *ad vitam aut culpam*.

PLACE OF NEXT MEETING.

The HON. SECRETARY said he thought that, with reference to their place of meeting for next year, though they were very glad to see so many present, it had been inconvenient for several to attend in Sligo. He felt that they would have had a larger gathering if Sligo had been more accessible; and he considered that they ought to go to some place which would be more convenient for the members. He questioned if Longford would be easier to get to than Sligo; and although they were in Dublin last year, yet, seeing that the name of the Association had been changed, with a view to inviting members from all parts of the country, he had pleasure in proposing that they visit Dublin again next year, under the new name of the Association.

Mr. SCRIVENER said, as a Dubliner, he had much pleasure in seconding the proposition.

The motion was agreed to.

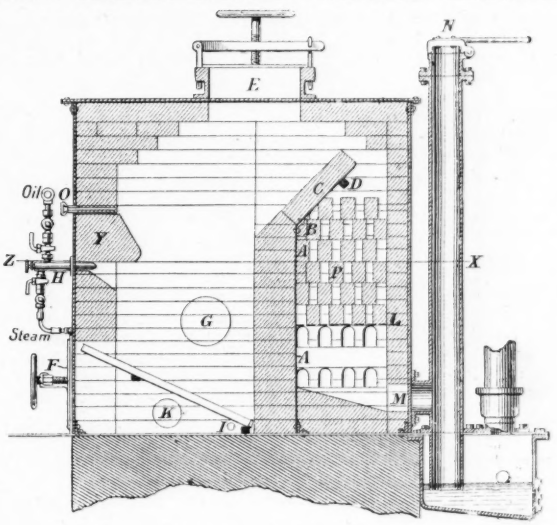
PROFESSOR LEWES'S METHANE HYDROGEN WATER-GAS PLANT.

The PRESIDENT submitted an explanation of Professor Lewes's methane hydrogen water-gas plant, as he had fitted it up. He said he had had the plant working for two days, and the results were satisfactory. He was sorry that he could not show it in operation, because his men had been called off to other work. He then proceeded to read a paper descriptive of the plant, and said he would be pleased to show it to anyone who wished to see it.

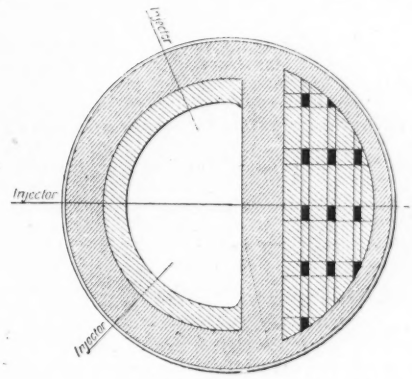
The generator case is to be a cylinder made of stout boiler plate, with the top fitted to the angle-iron rim by screw-nuts, and the bottom riveted to angle-iron. The early generators I made were oval; but this allowed too much play on the sides. A is a partition of stout plate, riveted to the sides and bottom 4 feet from one side, divides the generator into two parts to a height of 3 ft. 6 in. from the bottom, and carries at the top a strong angle-iron B, to act as a support to the 4½-inch fire-clay slabs C, which are further supported by an iron rod D, bolted to the sides of the generator. These supports are necessary, as the slabs must be movable to allow the building-in of the superheater. On the furnace side of this partition, there is a 9-inch fire-brick lining, which extends round the furnace. At the top of the generator is the charging-door E; while at F is the clearing-door. The bottom of the furnace is formed of fire-bars of large section, supported at an angle, as shown; while at the side, just above the level of the bars, it is well to have a removable plate or manhole G, in case of big clinkers that cannot be cleared from the bars.

About 3 feet from the floor are fitted the oil or tar injectors H, recessed in a groove which runs round the lining of the generator. (If the projection is not made too sharp, it does not fuse away; and if there is trouble, a water-ring can always be substituted.)

LEWES'S METHANE HYDROGEN WATER-GAS GENERATOR.



SECTIONAL ELEVATION.



SECTION THROUGH X Z.

The injectors can be of any of the well-known forms, with oil fed at a fixed rate by gravity from above, and "slathered" into the fuel by superheated steam at the highest pressure obtainable. For good working, a small high-pressure boiler, giving an initial pressure of 100 lbs., and not falling below 60 lbs. in the run, is best. Besides the steam-tubes leading to the injectors, there is a steam-pipe I below the lowest point of the fire bars, running across the whole breadth of the generator, and pierced with very small holes on the outer side. These are to supply the steam necessary to wash up in the fuel, towards the end of the run, the gases from the heavier hydrocarbons, which sink in the fuel instead of rising. The air-blast K enters below the bars from one side. A Roots blower is better than a fan, as it gives an absolute pressure. It should be large as compared with the work it has to do, as a good deal of economy is derived from a very rapid, and what a few years ago would have been considered an excessive, "blow," as the more complete the combustion—*i.e.*, the less carbon monoxide—the less fuel is used to gain a given temperature.

The form of the generator, although awkward, is of importance, as when using a tar or heavy oil, there is a lot of carbon liberated from it; and I find that if the gases have to pass

through the top layer of but little heated coke, it acts as a filter, and does away with a good deal of the risk of choking in the superheater. The deposited carbon also is brought down by the coke to the zone of combustion, and is utilized; while the coke itself is dried and heated before being burnt. The superheater has the top part built in with a chequer work of fire-brick, which can rest on a grating at L; while the lower part is built up of pig iron or old furnace bars, which during the run decompose any surplus steam to hydrogen, and are again reduced to iron in the next blow. The floor of the superheater must slope down to the exit M; so that if, as the result of improper temperatures, any tar condenses, it will run down to the hydraulic seal.

In working the generator, the fuel is put in until full up to the top of the charging-shoot, all openings are closed gas-tight, and the "snift-valve" N is opened. This valve consists of a heavy iron cap working on the faced top of the blow-off pipe, to which it is hinged, as shown. It works very well in practice; and the importance of doing away with valves for the hot gases cannot be overrated. The fuel being lighted, the blast is turned on, and is kept blowing until the fuel shows red through the sight-hole O, consisting of an iron pipe with easily removable cap glazed with mica, which has to be taken off and cleaned from time to time, as a little tar vapour condenses on it. When the fuel shows red at the sight-hole, the air-blast must be cut off (there must be a valve between the blower and the generator, as close to the generator as possible), the snift-valve closed, and the oil and high-pressure steam turned on to the three injectors; the exhauster being started to give a level gauge at the generator. The minimum quantity of steam must be used; and after the injectors have been going a minute, the steam is turned on below, and the run continued until the temperature seen at the sight-hole is reduced from a bright to a dull red. The oil and steam to the injectors are then stopped; but the steam at the bottom is continued for a minute, to wash all hydrocarbon vapours out of the fuel and superheater. When the steam is cut off, the snift-valve is opened, and the blast turned on full until the temperature again shows bright red.

Pipes must lead from the generator and other parts of the apparatus to a series of gauge glasses fixed on the same board, so that the man in charge can regulate the speed of the exhauster. There should be a manhole into the superheater at the side P; and in making the generator, it should be so constructed that every part is easily accessible. In case of a failure in the carbide supply, this generator works equally well with "solar distillate" or other gas-making oil.

Discussion.

Mr. T. G. Marsh (Manchester) said he had not had an opportunity of examining this water-gas plant; but he had, on several occasions, seen a description of it, before it came into use. Water-gas plants that were in use now took up considerably more space than the generator in this plant would appear to do. The plants which he had seen on the other side of the Channel were so large that there would be considerable difficulty in putting them into many of the Irish gas-works, in consequence of the price of the generators. The generator in this plant appeared to him to lend itself more particularly to medium-sized works. With the generators he saw on the other side of the Channel, a very great amount of care had to be exercised, because, if the operator in charge of the machine was at all careless in the time of his passage of air and his passage of steam, the result would be that a very serious defect would be encountered. For instance, if he continued to run steam too long through the generator, the coke became sodden; and they would find, in addition to getting the carbonic oxide sent forward, that they would send forward a large percentage of carbonic acid. They all knew that, if they sent carbonic acid forward, they had to take it out again; and consequently there was a considerable expenditure required for purifying material. Further, the extra quantity of carbonic acid sent forward required to be enriched by the oil; and therefore they would have to incur an extra cost for oil as well as for purifying material. The apparatus before them looked to him to be much simpler. It was very compact. It had the generator and the superheater all in one. As to how the carburettor acted in the same generator, he was not in a position to say. This was a matter which could only be found out by a series of tests, which, he felt confident, no one was more competent to make than their President, Mr. Tully, who he knew had given a considerable amount of time to the chemical aspects of the subject. The advantage of this gas of Professor Lewes's was that there was nothing like the quantity of carbon monoxide that there was in water gas as used generally. As he had said, one of the difficulties with water gas was the quantity of carbonic acid sent forward, through no want of care. Mr. J. W. Helps, of Croydon, applied to him some time ago in regard to this matter, and said he found that though the man attending to his generators had very little work—all he had to do being to look after some valves, and close one for seven, and open the other for three minutes—he had to watch the clock. This seemed to be looked upon as no work at all; but Mr. Helps said that if he had to do it he would think it very hard labour, and that the only possible man they could get to undertake it would be a man without any thought or mind at all—that, in fact, it was a most arduous job. In a few instances, they had an electric bell. Mr. Helps told him that if they made a run a minute too long, the carbonic acid increased by 9 or 10 per cent., which was, of course, disastrous. He suggested that some mechanical means might be arranged; and there would be very little difficulty about that. He (Mr. Marsh) was fixing up there now a simple arrangement by which they could check the man, and see if he kept the time required—in fact, make his life a little bit more miserable than it was at present. In addition to this, he had made a machine which he had just patented, and which was rather a peculiar one. It was an automatic analyst. It was a machine which would make a diagram, in the same way that a pressure register did, and show the proportion of carbonic acid there was in the gas, as it was made and as it was sent forward, so that the manager could himself see the diagram in the morning, and ascertain the proportion of carbonic acid which had been sent out during the night. This, of course, was a thing which was more applicable to medium and large-sized works than to small ones. With the apparatus in question, they would not have nearly the amount of trouble they had at present. In the matter of the price of coal, he was entirely at one with the President that the ill had its remedy; and though the high price they had been charged for coal now might appear to them to be likely to reduce their profits, he was satisfied in his own mind that it was one of the great benefits they had that occasionally their raw material went up in price, for the simple reason that if they got a thing too cheap, they became wasteful of it, and did not seek to save it. In regard to coal as it was used in gas-works now, and as it was employed some twenty years ago, they were selling 10 per cent. more gas per ton than they made then. The result was that, with the high price of coal, those who used it would apply the resources of science, and do everything they possibly could to save the coal. The price would then go down; and, when this happened, they would have much greater profits. He believed an advantage would come to them in this way. The price of coke would be most materially enhanced on account of the high price of the coal with which it competed. But, in addition to this, water gas had been introduced very largely, not so much for the purpose of competing with coal gas (because water gas was not very much cheaper than coal gas, when they had to use oil, which had also gone up in price), as to enable them to meet sudden contingencies. These water-gas plants would use up a large proportion of coke; and when this occurred, a scarcity of coke would be experienced—not an artificial scarcity, but a real one.

Mr. G. W. Norman (Dublin) said he would like to ask the President, for the information of gas managers in smaller towns than his own, about the general cost of the plant. He wished to know whether it would be useful for smaller works, and whether they could go in for it at once.

Mr. S. B. Langlands (Coleraine) asked if Mr. Marsh could tell them whether the apparatus he spoke of for telling the overplus of carbonic acid was a chemical appliance.

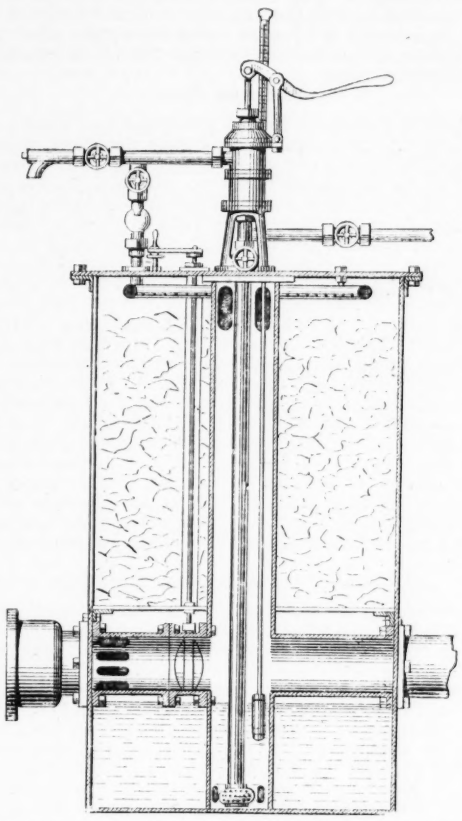
Mr. Marsh said he did not know that there was any particular secret about the machine, because it simply carried out mechanically the old process which the ordinary analyst did, and marked it on a diagram. Of course, he had had a great many troubles in connection with it, as they had in most things—the idea, for instance, in connection with automatic meters, which he first brought out. But he thought he had got this thing right, and that in a few months' time they would have illustrations of it pretty generally.

The President said, in reply to a remark by Mr. Marsh, that, of course, it was possible to carburet the gas in the apparatus, by introducing the oil into the superheater at the top; but he did not intend to do so. He meant to carburet the gas as it left the works for the town, through an independent carburettor. As to carbon monoxide, they would see that Professor Lewes's carburetted water gas contained 15 per cent., as against 33 per cent. in ordinary carburetted water gas; and it came very close to ordinary coal gas—being only 5 per cent. more. It was this fact that induced him to adopt Professor Lewes's process. Mr. Norman asked the cost of the plant. He thought that an apparatus such as he had could be fitted up complete, with blower and gas-engine, for from £200 to £250. That was a plant capable of making 50,000 cubic feet of gas per day.

Enrichment of Gas with Benzol or other Light Hydrocarbons.

The President introduced this subject. Referring to the accompanying diagram, he said that some time last winter he looked into the question of the enrichment of gas with benzol, and he set about designing and constructing the apparatus before the members, which had been working since February last. In the period from the 8th of February to the 8th of July, 9,166,000 cubic feet of gas were made, of which 4,583,000 cubic feet, or about 50 per cent., of the whole, was passed through the apparatus in the hours between 30 minutes before sunset and 11 p.m. The enriching medium he used was crude naphtha—the first runnings—of about 8·928 sp. gr. They had used 106 gallons of naphtha, at 10d. per gallon. The total cost of enrichment was £4 7s. 6d., and the cost per 1000 cubic feet worked out at 0·23d. Coke baffling was used in the apparatus. The gas he supplied ordinarily was of about 15-candle power, and this enriched it up to about 18½ candles. He found that the gas passed through the town in from five to ten minutes. The

naphtha vapours were taken off at the ordinary temperatures, and they had not time to deposit, and did not deposit, in the town mains; neither had they affected the meters. The appliance was exceedingly simple.



TULLY'S NAPHTHA ENRICHER AT THE SLIGO GAS-WORKS.

[The President had a small glass experimental apparatus on the table, with one light burning unenriched gas, and another enriched gas. The effect of the enrichment was quite apparent.]

In answer to a question, the PRESIDENT said the cost of the apparatus would be, perhaps, from £50 to £70, according to size. He must say that he would be very sorry now to be without it. He had it fitted after the governor.

WELCOME BY THE SLIGO GAS COMPANY.

At this stage of the proceedings,

The PRESIDENT said it gave him very great pleasure to introduce to the members the Chairman of the Sligo Gaslight and Coke Company—Mr. Gorman—who desired, on behalf of the Company, to extend to the Association a welcome to the town.

Mr. R. GORMAN said he was exceedingly pleased to come there and see the happy faces round the table. He was glad the Association were meeting in Sligo, because, being so far west, they were delighted to see a stranger. As to the working of the Gas Company, he and his brother Directors had been charmed by the way in which Mr. Tully had conducted the business during the ten or twelve years he had been Manager. Mr. Tully had reduced the loss by leakage from 60 to about 10 per cent. There was something in that. It seemed to him, reading Mr. Tully's address, that all gas managers should endeavour to do likewise. One thing he would advise, and that was that they should endeavour to bring somebody to their towns to lecture upon gas-stoves. Under Mr. Tully's advice, the Directors did this; and he thought it was their greatest help. It assisted them to the extent of at least 2 per cent. In small towns, they never had the chance of hearing lectures upon these things. He thought that if coal cost 7s. or 8s. per ton to carry, there was great advantage in employing gas. The use of gas-stoves, he thought, was the greatest lever they had in making the balance-sheet come out right.

Mr. PERCY GRIFFITH read the following paper:—

IMPRESSIONS OF SMALL GAS-WORKS IN IRELAND.

My only excuse for presenting the following notes on Irish gas-works to a body of Irish gas engineers is that I have undertaken this very formidable task at the urgent behest of your President; and I can only hope and believe that such an excuse may serve to mitigate the severity of your criticism, as well as to justify your giving me a patient hearing. My reluctance to attempt a paper on this subject was the greater because of the comparatively few opportunities I have had for making a special study of Irish gas-works generally, as distinguished from English works. If, therefore, my knowledge of them should appear somewhat superficial to Irish engineers, or my conclusions in any way unwarranted, I must ask you to give me freely such correction as may appear to be necessary in the course of the discussion.

It will be best in the first place to explain that last summer I made an extended tour, chiefly in the western provinces, for the purpose of reporting upon the value and prospects of a number of small works, which, owing to various causes, but principally the want of capital for extensions, were in a more or less stagnant condition, as well as for the purpose of inspecting various small towns where there appeared to be good openings for the establishment of new works. I need hardly say that my tour proved extremely interesting and instructive, more especially as I had the company of your President most of the time.

I propose to divide my paper under sundry heads for convenience of reference and discussion; and as the time at my disposal has been extremely limited, I will confine my remarks within the shortest possible compass.

OWNERSHIP OF UNDERTAKINGS.

I was throughout my tour very much struck by the number of works in the hands of individuals, as well as by the absence of that competition between local authorities and companies, which is, at the present time, so important a factor in English gas undertakings. The first point is, in my opinion, a serious disadvantage in many respects, and one not easily accounted for, unless it be due to a want of enterprise on the part of engineers and capitalists generally. The results are, however, very obvious and decidedly antagonistic to that progress which you, as gas engineers, have very much at heart. The private owner, having but a limited supply of capital, and being naturally averse to investing the whole of it in one undertaking, has neither the means nor the desire to extend and develop his works and mains except so far as can be done from time to time with surplus profits—that is, with whatever balance remains after paying himself a fair minimum interest on his invested capital.

Under such conditions, it is obvious that any development on modern lines—such as, for example, the hiring of stoves, fittings, and slot meters—is utterly impossible; and, consequently, in those works owned by individuals a restricted supply and high charges are the rule rather than the exception.

The non-interference of local authorities with the supply of gas to their constituents has no doubt been accounted for in the past by the absence of local representation on those bodies as it is understood in England; but no doubt the recent creation of county and urban district councils will very shortly make a difference in this respect. At the same time, I think few engineers or managers will look forward with satisfaction to a time when local authorities shall consider the ownership of gas-works within the ordinary scope of their duties, and make a general practice of buying them up at the lowest possible figure. In my opinion, this policy, whatever its advantages may be, would not conduce to that peaceful advance of scientific improvement which alone can secure the best quality of illuminant at the lowest possible price.

CAPITAL.

As far as my observation has carried me, this may be considered the vital point in connection with the gas industry in Ireland. Whether I am correct or not, you will be able to decide more definitely and reliably than I can. In nearly every case I investigated, whether gas-works were already in existence or not, the difficulty appeared to be the same—viz., how to raise sufficient capital either to construct or to extend the necessary works and mains, and this notwithstanding the fact that every existing undertaking was paying a very fair percentage of dividend or interest on capital invested. That there is an absence of capital in Ireland has been most positively denied by very competent authorities; and I must therefore abandon any attempt to explain what is, to my mind, the most serious bar to progress in the industry we are all so deeply interested in.

Even in the case of small limited companies, I found it quite a common practice to utilize surplus profits (when made) for the necessary extensions of plant or mains, rather than to raise additional capital for the purpose—a practice which, although improving the security for the original capital from year to year, and maintaining a low proportion of capital, must be fatal to that expansion of the business by which alone it can be rendered prosperous and secure. The rates of charge prevailing among the small works, and the absence of any engine, stove, or meter business, may, I think, be taken as more or less direct results of this system.

ACCOUNTS.

The practice above referred to naturally produces a form of accounts which is very puzzling to one unaccustomed to it. Of course, it does not follow that this is necessarily misleading to Irish accountants or Irish shareholders; but it must at least be granted that balance-sheets based on this system do not give an accurate representation either of the actual capital value or the net maintainable profit of the undertakings to which they refer. Consequently calculations for ascertaining value are extremely complex, and largely depend for accuracy upon information not to be found in the balance-sheet at all in many cases.

No doubt the peculiar and very various forms in which gas accounts are kept in Ireland arises partly from the absence of any common form, such as is provided in the Gas-Works Clauses Acts; and I will therefore turn for a moment to the question of

Parliamentary Powers.

To an English engineer, the absence of any statutory powers, except among the largest works, appears very remarkable, and bears ample testimony alike to the reasonableness of the road authorities in regard to main laying and repairing, and to the honesty of the consumers in accepting (and, presumably, meeting) a liability not enforceable by parliamentary authority. In my opinion, however, it would materially assist the development of the gas industry in Ireland if parliamentary powers were more generally obtained. In the first place, the adoption of the General Acts would secure uniformity as regards account keeping and general financial management, as well as the quality and supply of gas. The general stability afforded by parliamentary sanction and support would also strengthen the financial position of any particular undertaking, and render the raising of capital more easy than it now is. Further, the restrictions in respect to the price of gas would certainly prompt owners and managers to adopt the most improved systems of manufacture in order to reduce the cost to a minimum. And, finally, the annual returns as to capital, loans, gas made and sold, profits, price charged, &c., required of all authorized gas undertakings, would, I think, prove of inestimable value to all gas engineers.

While dealing with this subject, I must, however, refer to the extravagant cost incurred in obtaining parliamentary powers under the present system, which requires promoters, opposition, and witnesses alike to travel to London and back in order to secure a hearing. It can hardly be expected that parliamentary powers will be generally sought by the smaller gas undertakings while the trouble and expense are as excessive—and, apparently, unnecessarily so—as they now are; and it is earnestly to be hoped that Parliament may soon see its way to bestow upon Ireland the privileges in this respect recently conferred upon Scotland—viz., that of having the details of all Private Bills settled in the Capital City.

Condition of Works and Mains.

The general condition of the smaller works will no doubt be better known to you than it is to me; but I think I may fairly deal with what I myself saw, and leave you to judge how far this state of affairs is general throughout the country.

Buildings.—With regard to buildings, I may say at once that they were generally of the most substantial character, and in a remarkable state of preservation, even when obviously old and neglected. The natural supply of limestone, and the practice of making all walls about 2 feet thick, no doubt accounts for this.

Land.—The works I visited were nearly all very favourably situated as regards land, having ample space for extensions, both on the existing sites and adjacent thereto. The system of land tenure is, of course, different to that common in England, and is usually based upon a very long, sometimes interminable, lease at a nominal annual rent. It is not within the province of this paper to deal with this subject, as it varies but little from the English freehold tenure. The price of land is, however, generally extremely low; and there is less difficulty in getting convenient sites than is the case in England.

Retort-Settings.—These are almost universally of the ordinary type; regenerators are extremely rare. Machinery for drawing and charging is also entirely absent from the smaller works; and, in fact, the general design of settings, retorts, and fittings is often of the most antiquated type. Retorts of cast iron, as small as 13 in. by 13 in. by 7 ft. long, in arches containing one, two, or three retorts each, are not uncommon; and in some cases, the whole of the coke made is consumed in the furnaces. It is obvious that where such conditions prevail, an exorbitant charge per 1000 cubic feet is necessary to secure any return for the capital invested. The gas made per ton of coal is also, of course, much below what it should be; and the capacity of the retort benches, too, is small proportionate to their original cost.

Condensing, Washing, and Scrubbing and Purifying Plant.—The general plant of the works I visited was in many cases extremely inefficient, and suggested that a test of the gas would have revealed a very undesirable state of affairs. Very rarely was any attempt made to collect or utilize the ammoniacal liquor, although tar was generally sold, in small quantities relatively to the coal carbonized, at a good price. Exhausters and washers were also rarely met with; and the working results will, therefore, be readily imagined without further data.

Storage.—The gasholders were invariably small and in want of repair, and the tanks leaky—in fact, at one works the holder was erected in a pond formed by filling an old stone quarry with water; the guiding columns being erected on separate piers built on the floor of the quarry. The holder itself was therefore practically inaccessible except by boat or raft.

Mains.—Mains were perhaps the most deficient part of the various works, being small, leaky, and never carried as far as would have been warranted by the demand. In some cases, public lamps were supplied by small service-pipes extending several hundreds of yards, where a little canvassing would have secured consumers *en route*, and have justified the laying of a proper main.

Generally.—Of course, the foregoing remarks must not be taken as necessarily involving all the small works in Ireland, or even all those which I inspected; neither do I mean to imply that where such conditions as I have indicated prevail, the fault lies with the managers. The general difficulty appears to be in raising the necessary capital for properly extending and developing the works; and it is small cause for wonder that, in such circumstances, capable managers are difficult to procure, and more difficult to keep.

Price of Gas.

I have already referred to this point, and need hardly repeat that, under the conditions which I have described, a low rate of charge is obviously impossible if any dividend or interest is to be made on the capital invested. Rates of 5s., 6s., and 7s. per 1000 cubic feet are not at all uncommon, and special rates for cooking-stove or engine supplies are by no means general—in fact, it was evident that many of the works would have been totally incapable of meeting any such additional demand for gas as these supplies would have created; and as in these cases it would certainly have paid to reduce the price of gas, apart from any reduction in the cost of manufacture, it is clear that incapacity to meet the increased demand which such a lowering of rates would have produced, was the real reason for the maintenance of the high charges. I may, however, say, with every confidence, that in no case investigated by me was the charge made for gas warranted. In other words, a trifling capital outlay would invariably have produced such a reduction in the cost of manufacture, and such an increase in the capacity of the works, that a lowering of the charge would have been eminently feasible without any sacrifice of profits or dividends—in fact, these would, I am confident, have been increased rather than diminished by such a progressive policy.

Stoves, Fittings, and Slot Meters.

It need hardly be said that the modern practice of hiring stoves and fittings, and of doing so by means of a fixed scale of prepayment based on the consumption of gas, has not yet reached any of the smaller Irish works. The comparatively heavy capital charges involved in this system are quite sufficient to account for this as matters now stand; but it is earnestly to be desired that some means may be found to overcome the difficulty, alike in the interests of the smaller consumers and those of the gas industry generally. The advantages of this system have now been fully proved in England, both in large towns and rural districts; and granted the necessary capital, there is no reason whatever why it should not prove equally successful in Ireland.

Residual Products.

Tar.—The manufacture of tar for sale appears to be very much neglected in the works I visited—and that in spite of the fact that there was generally a good demand for it.

Liquor.—As previously stated, the liquor was in most cases thrown away; and one could not help remarking that there seemed little difficulty in turning it into the nearest ditch or watercourse—a state of affairs which is now very rare in England. It is probable that the newly constituted local councils will shortly begin to interfere with this in the interests of those relying on such sources for their domestic water supply, in which case it will be necessary to pay a little more attention to this very valuable product than has been given it up to the present. In an agricultural country such as Ireland, it would seem that sulphate of ammonia would fetch a very good price; and I believe it does so, although I have not the actual figures before me. The only difficulty appears to be in the case of the very small works where separate sulphate plants would hardly pay; and for these, I would suggest the erection of small concentrating stills at the works themselves, in order to reduce the bulk of the liquor for carriage to the nearest sulphate works. Such works could then be erected very profitably at convenient centres within easy reach of the smaller gas-works on the one hand, and shipping ports for export of the finished product on the other.

Coke.—As regards coke, I need only call attention to the desirability of increasing the amount available for sale per ton of coal carbonized to the utmost, as in every case a good price could be obtained locally. Moreover, with the recent development of water-gas plants in the larger cities, there is likely to be an opening for coke at a paying price there, which has, of course, not existed before.

Openings for New Works.

In conclusion, I may add a few remarks upon the scope that exists in Ireland for the erection of gas-works in the small towns hitherto neglected. I have, as previously stated, visited a number of such places, and, by personal inquiry, have satisfied myself that a gas supply would be cordially welcomed, and immediately adopted, by the principal shopkeepers. In most Irish towns, there are either convents, workhouses, gaols, or court-houses, as well as other local public buildings and offices, that would become large consumers of gas; and every gas manager will appreciate the value of the "large consumer" to a small undertaking. The only thing needed is apparently that so often referred to in this paper—viz., the necessary capital, coupled, of course, with such enterprise, energy, and engineering skill as are necessary in every manufacturing concern of a similar nature. The last mentioned is also peculiarly necessary at the present

time, when gas making is being elevated into a fine art, and the chemical processes involved are every day being more closely investigated and more and more scientifically carried out.

Let me, before closing, once more apologize if I have seemed to depreciate the gas industry as practised in Ireland too severely, or more than is warranted by the facts. It will be sufficient for my purpose if I have drawn the attention of your Association to the splendid opening that your country affords for the development of your own particular business among the smaller towns; and I hope that the suggestions I have thrown out will not seem too presumptuous coming from an English Engineer with so much less experience of Irish gas-works than you have yourselves. Should this be the case, I can undertake to accept your criticisms with a perfectly open mind, being confident that the time taken in studying this important subject will not have been in any sense wasted.

Discussion.

Mr. S. B. LANGLANDS (Coleraine) said that in Mr. Griffith's paper they had an excellent lever with which to move gas companies and corporations to a new order of things. It seemed to him that Mr. Griffith had a thorough grasp of the difficulties gas managers had to contend with; and he thought the Association should accord their best thanks to the author for his valuable communication. If at any time they wished to bring before their companies or corporations any questions as to extension, reduction in price, or anything of the sort, he was convinced that they had in the paper the very best means for moving them.

Mr. S. A. SCRIVENER (Dublin) thought that they certainly had before them one of the best and most important papers which had been read to the Association for some years. More than this, they had at Sligo one of the best examples of what could be done when suggestions such as those contained in the paper were followed up. The President had spoken of a 60 per cent. leakage, and what he had done to reduce it; he had also told them something about the difficulties he had had to contend with. In no walk in life could they earn money without spending it. This was particularly true in the gas business; because if they tried to make gas upon the lines on which it was made thirty or forty years ago, they would be clean out of it. In view of the newer competitors they had, in the shape of electric light and others which had sprung up, they required to produce more gas, and to have more lights burning. The President had done this. He had been doing what they should all do—seeking to provide gas for various purposes, and at a price which would enable the people to avail themselves of its advantages. He had succeeded in making much more gas, with practically very little addition in the way of charges. His management of the gas-works in Sligo had been a great success.

Mr. W. A. REID (Longford) read the following paper:—

SULPHATE MAKING AT LONGFORD.

Having mentioned to some of my brother managers that I had a small sulphate plant working, and was making a very fair profit from it, they persuaded me to give a paper on the subject, and it was with great reluctance that I consented to do so. But as the paper is chiefly for the benefit of managers of small works, it may be the means of encouraging them to follow in my footsteps. I will state, first, that my reason for thinking of a sulphate plant at all was that we were told that our liquor was finding its way to the River Shannon and causing a nuisance, and that we ought to find some other way of disposing of it. My Directors were hard to convince that it would be a profitable business to incur the expense of erecting a house and sulphate plant; but by producing figures to show that it would be a profitable transaction, they at last gave their consent to procure tenders for the work, which were received from three firms. After going carefully into the matter, it was decided to give the contract to Messrs. R. & J. Dempster, at a cost of £136.

The apparatus for sulphate manufacture differ in many ways; but the plant decided upon was adopted on account of its simplicity, and is known as the direct-firing system, with open fishing saturator. The plant consists of a shell boiler still 9 ft. by 3 ft., fitted with safety-valve, and saturator 2 ft. 6 in. by 2 ft. 6 in. by 2 ft. The condenser is a brick-built cement-rendered tank 12 ft. by 6 ft.; the pipes being submerged in water. The purifier is 4 feet square and 2 feet deep, filled with bog ore (natural oxide of iron) for the removal of the sulphuretted hydrogen. The waste liquor from the still is allowed to run into a pit and filter away in the earth, causing no nuisance whatever. The purifier is built of brickwork, without a cover; the gases after leaving it escaping into the atmosphere. When everything was complete, and the plant put to work, I found it was impossible to get salts in the saturator; the saturator always filling, thereby compelling me to resort to the evaporating pan.

Having tried several plans, such as shifting the catch-box nearer the saturator and covering all the pipes with a thick coating of straw, and firing stronger (so strong that sometimes the still would boil over, and make it very unpleasant to remain in the house), I at last arrived at the conclusion that the heat of the boiler was not sufficient. I decided therefore to connect a pipe from the steam-boiler and attach it to a larger dry-steam coil in the still, which had the desired effect, and my troubles were at an end.

When working, instead of the saturator filling with condensed steam, I have now to add water to it when fishing; and instead of the boil taking 24 hours, it is done in less than 8 hours. I can also get a splendid heat in the saturator, so that the salts come out as white as snow; and I must say the plant is in every way giving great satisfaction. I am much handicapped on account of the very high price of acid—£2 2s. 6d. per ton in Dublin, to which must be added railway carriage, 19s. 6d. per ton from Dublin to Longford, and 5s. per ton from the railway to the works.

My scrubbing plant is not sufficient to enable me to work up the liquor as I should wish, having no washer, and having to depend solely on the scrubber, which is 16 ft. by 4 ft. 6 in. well filled with boards. The liquor is kept pumping backwards and forwards through the scrubber until it is nearly 5° Twaddel; and under these conditions, it is impossible to remove all traces of ammonia from the gas. If a washer were working, the profits from the sale of sulphate would be greatly increased.

When first I tried to introduce the sulphate locally, I could not get the farmers to appreciate the value of this important manure, and they would not give as much as £10 a ton for it when they could get other chemical manures at less than half the amount. But by perseverance, I got one farmer to realize its great value and give it a trial on his meadow. Before six weeks he was the proudest man in the district, and had his neighbours to see his meadow—it being so much better than the others, which had been treated differently. From that time forward, I had very little trouble in disposing of what sulphate we made at home, which you can understand was more profitable to us than bagging and paying carriage on it.

The manufacture of sulphate on small works costs nothing for extra labour; and the fuel used for firing is breeze, which is practically of no value. The profit for the year was £27; being almost 10d. per ton of coal carbonized. This is a small return in comparison with larger works having efficient washing plant; but I consider it is better to have even this small sum to our credit than let the liquor run to waste, and perhaps get us into trouble. The working of the sulphate plant is so simple and satisfactory that I wonder it is not more generally adopted by small works in this country.

Discussion.

The PRESIDENT said he thought they ought to feel obliged to Mr. Reid for having come forward with his paper, although it was at the last moment, and for giving them his experience in the manufacture of sulphate of ammonia in his works. He was sure Mr. Reid showed a great deal of pluck in going in for this business. It was a thing, he thought, which could be very profitably adopted by many more who had not already touched it. In his paper, Mr. Griffiths said something about concentrating the liquor about the works. He himself had looked into this matter, and he thought it would be far better for Mr. Reid to do this, or manufacture liquid ammonia, than to import sulphuric acid into Longford. He could produce pure liquor ammonia of ·910 sp. gr., which would be equal to 25 per cent. of ammonia. This would be even in a more concentrated form than sulphate; and he would get rid of the high carriage charges on his stuff of which he had spoken. No doubt he would find a ready market for liquor ammonia, purified with lime; and a very much simpler apparatus than the one he had at present would produce pure liquor ammonia. It could be packed in iron or tinned iron drums, and sent to Dublin or elsewhere, where there was a very good market for it. He thought they should look to inland towns to manufacture pure or crude liquor ammonia. In the event of its not being in demand, works for the manufacture of sulphate could be put up. He thought the members should express their obligation to Mr. Reid for giving them his paper.

The HON. SECRETARY said he introduced the manufacture of sulphate of ammonia into his works; but he did not go in for any of the patent systems such as, he understood, Mr. Reid had—in fact, he did not know whether they were in vogue when he started his. He began on the old conventional lines. He procured an old boiler, cut out the flue, plated up the ends, and put in a steam-coil, supplied from a boiler, with a steam-trap on the outlet. Perhaps he did not get as good results from this plant as he would have done from a patent apparatus; and certainly there was one thing he must admit—he was not able to use breeze. He felt, when he was putting on his sulphate plant, that he was stinting himself of coke. He had to use coke in the apparatus; and when he ordered the sulphate plant on, there was trouble in the coke yard, because they got short of coke for their customers. He was consequently sometimes forced to delay putting on the sulphate plant on account of the want of coke for fuel. Mr. Reid said something about the plant giving him perfectly white sulphate. He wondered how this could be—whether it was anything in connection with the plant, or whether it was the acid that was used. He himself, using pyrites acid, very dark in colour, found that the only way he could get white sulphate was by a little manipulation—by putting either a little tar into the still or a little tar or naphtha into the saturator. If he did this, he got perfectly white sulphate; but if he proceeded in the ordinary way, simply putting ammoniacal liquor into the still, and nothing into the

saturator but vitriol and water—which, of course, they required to keep up the level of the liquid, in order to seal the curtain—he obtained a brown or a grey sulphate. But by adding a little tar or a little naphtha, he got it white. Of course, sometimes they liked to see it white; but it was not very material—the price was the same, whether it was white or grey. He thought that every works of any size should have a sulphate plant. As to what the President said about the manufacture of liquor ammonia, he had sometimes thought of this; but he could not see how it was to be done. Sulphate was, perhaps, the best, because if they made strong liquor ammonia, they would have it in a form that was not very stable. It was easily evaporated; and he could not think that it would be very profitable. In the form of sulphate, it was stable; and they could either sell it or carry it about without any trouble. He would like to know, if Mr. Reid could tell them, how he could make the sulphate white without any additional tar or naphtha.

Mr. REID, in reply, said that one of the chief reasons for his mentioning that he obtained white sulphate was that a great many managers were in the habit of getting very dark sulphate; and he saw a paper not long ago, in which a manager said he secured white sulphate by simply keeping the saturator warm—that before that he never could get enough heat in the saturator to make the sulphate white. It was since then that he himself had got it white—as white as the driven snow. He thought that the plan Mr. Whimster mentioned, of putting a little tar into the apparatus, only worked for a time. It then went back again. But the whole secret of getting white sulphate was to keep the saturator as hot as possible.

The PRESIDENT said that Mr. Whimster had spoken about working an antiquated arrangement. It was a somewhat antiquated arrangement he himself adopted eight years ago; but he must say that if he had to start again to-day, it would be the same. He could charge it in the morning, turn the key in the door, and leave it till the following morning. The fireman had instructions as to the turning on of the steam the following morning. The apparatus was then re-charged, a process which took about half-an-hour. They could make white sulphate. They took out the arsenic and other impurities in a settling pond. He was convinced that, for works the size of his, the arrangement he had was sufficient. He was satisfied with it. He worked with a closed still, which was a very old arrangement.

Mr. REID asked if the President was ever troubled with the acid and liquor becoming crystallized in the saturator.

The PRESIDENT: No. Continuing, he said that, with regard to white salts, and the using of tar in the still, his experience was that they always got sufficient tar in the substance to whiten the salts in the liquor.

VOTES OF THANKS.

Mr. S. A. SCRIVENER (Dublin) proposed a vote of thanks to the Mayor and Corporation of Sligo for the use of the rooms in the Town Hall.

Mr. T. LLEWELLYN (Newbridge) seconded, and the motion was agreed to.

Mr. F. J CLARKE (Ballinasloe) moved that they give their heartiest thanks to the Chairman and Directors of the Sligo Gas Company for their kind and handsome reception of the Association.

The HON. SECRETARY seconded, and the motion was agreed to.

VISIT TO THE GAS-WORKS.

At the conclusion of the meeting in the Town Hall, the members visited the gas-works, where they saw several evidences of the ingenuity and general capacity of Mr. Tully as a Gas Manager. By the gate there stands a wire-rope guided gas-holder. In the governor-house, there is the naphtha enricher which Mr. Tully submitted to the meeting. Another building contained the plant for the manufacture of carburetted water gas, which Mr. Tully described. In connection with this, it may be stated that the entire structure, including the shaping and riveting of the plates of which the outside shell of the cylinder is constructed, was the workmanship of Mr. Tully and his men, which, in itself, was a feat of engineering. The retort-house contains settings of sixes, and one setting of threes. In it is fitted the "Rapid" charging plant of Messrs. Biggs, Wall, and Co., of London. The apparatus was shown at work, manipulated by men who had been sent by the patentees. There being a crowd in the place, it was evident that the plant was not worked to its fullest capacity—in fact, Mr. Tully stated that his own men, in ordinary working, did better, which was held to be a proof of the statement of the patentees that the plant is eminently suitable for use by inexperienced men. The members were entertained to light refreshments by the Sligo Gas Company.

In the afternoon, they enjoyed a most charming drive round Lough Gill, through striking scenery—wood, rock, and water—a distance of 24 English miles. Dinner was served in the Abbey Hotel, at Dromahair, at the head of the Lough. The excursion was favoured with a beautifully sunny afternoon. Sligo was reached on the return journey at 9 o'clock in the evening. On alighting, the party were again entertained in the Town Hall Buildings by the Sligo Gas Company, and a smoking concert was organized, which brought out a great deal of fine talent; and at 1 o'clock on the morning of Wednesday, the curtain was rung down upon one of the most enjoyable of all the meetings of the North of Ireland Association of Gas Managers.

THE COMBUSTION OF SULPHURETTED HYDROGEN TO SULPHUROUS ACID.

In the notice which appears in another part of the "JOURNAL" of the recently-issued report of the Chief Inspector under the Alkali, &c., Works Regulation Acts, 1881 and 1892 (Mr. R. Forbes Carpenter), reference is made to the method of combustion of sulphuretted hydrogen to sulphurous acid, with subsequent neutralization of the latter by limestone in a tower fed with a flush of water on the top (the soluble product, bisulphite of calcium, flowing away afterwards to the drains), mentioned by the Chief Inspector and some of his colleagues in previous reports. As many inquiries were made last year concerning the method in question, Mr. Carpenter gives some precautions which have been found necessary in working, and sets forth the conditions necessary for success. They are as follows:—

1.—There must be command of draught at the furnace—*i.e.*, the suction at the condenser outlet must be adequate to supply this at all times, else sublimation of sulphur, with attendant evils, occurs. It seems to me quite possible that air might be supplied to the furnace under slight pressure, equal to that of the gases from the saturator.

2.—Adequate and complete cooling of the gases before the furnace, and also afterwards. If the gases enter the limestone tower above 100° Fahr., containing as they will excess of oxygen with sulphurous acid, the formation of calcium sulphate is promoted. This compound (gypsum) is but sparingly soluble; it forms a protective crust on the surface of the limestone, protecting the latter from its function of further action on passing sulphurous acid, and throwing consequently too great stress on the condensing efficiency of the upper layers of limestone in the tower, and causing low percentage condensation. At the same time, it should be clearly pointed out what are the difficulties accompanying condensation of water from a hot gaseous mixture containing this in the form of vapour in presence of sulpurous acid. On leaving the furnace at high temperature, cast iron is clearly the best material for cooling pipes. A point arrives, however, when temperature is so much lowered that water in condensing dissolves some sulphurous acid, and perhaps a little is oxidized to sulphuric acid, and corrosion of the iron takes place, especially at the chaplets of the pipes, which are of wrought iron; and voltaic action is induced by the dissimilarity of metals. Here is the point at which lead should be introduced, and continued to the base of the tower; taking care that there should be sufficient surface of lead (in itself a bad conductor and radiator) to ensure the delivery of the gas at the tower at the temperature not exceeding that named, and preferably lower. Such problems as this are of every-day occurrence with the chemical engineer, but seem of much complexity to engineers in gas-works practice.

3.—Cast iron does not seem the best material for use in the construction of the tower. Wood planks tongued and grooved have proved themselves to last well, even in summer heat; and brick and cement built towers have also well stood the test of time.

4.—The supply of water must be adequate, and it is best arranged if there are two forms of distribution—one constant, the other intermittent. If only intermittent, the intervals may be of too great length between flush and flush; for it must be borne in mind that limestone is not a porous body, and holds no reserve of condensing power within itself like coke. If, however, hard chalk is used, the intermittent flush only, at not too great intervals, is admissible.

The Nernst Lamp.—The "Electrical Review" of New York calls attention to the fact that very little is now heard about the above-named lamp. It is remarked that the hopes which were raised to a high point by the announcement of Dr. Nernst's invention have seemingly withered, and outside of the Paris Exhibition, there does not appear to be a single installation of the new lamp in existence.

Wood Gas for Public Lighting.—Some few years ago, a process for making gas from wood was introduced in Petersburg, South Australia; and a trial of the gas produced thereby was made in the Institute and the Town Hall. It is reported to have given so much satisfaction that it is now proposed to extend it to the streets. According to the "Adelaide Advertiser," any kind of wood is applicable; and the gas resulting from its treatment by the process referred to, which is stated to be "brilliant, of good power, and not glaring," can, it is claimed, be produced at 5s. per 1000 cubic feet. Patent rights have been secured for the invention in South Australia, Victoria, New South Wales, Tasmania, and New Zealand.

The Puech System of Water Filtration.—According to the "Revue Industrielle," M. Puech has recently devised a method of filtration for large quantities of water. The filter consists of three rectangular basins placed in juxtaposition, and separated by cemented brick walls. These basins contain three layers of gravel of different degrees of fineness. The first layer consists of pieces about ¼ inch diameter; the second of rather smaller pieces; and the third, of pieces about 0·3 inch in size. The water first passes through the coarse gravel, then through the other layers in succession. Very impure water thus filtered issues perfectly clear. The discharge per square metre (1·2 square yards) of filtering surface per 24 hours is 6600 gallons.

REGISTER OF PATENTS.

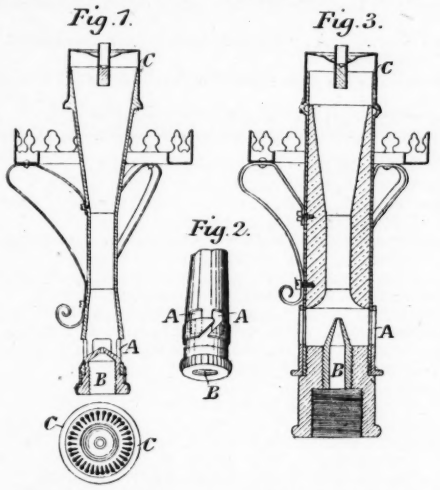
Incandescence Gas-Burners.—Duncan, J. H. H., of Coleman Street, E.C., the New Sunlight Incandescent Company, Limited, and Barnett, H. T., of Teddington. No. 14,995; July 20, 1899.

This invention relates to incandescence gas-burners of the kind especially adapted for use without a chimney, and with an ejector having the form of two cones united at their summits, as described in De Mare's patent No. 10,497 of 1894.

Fig. 1 shows a vertical section of the burner and a plan of the removable head or top; fig. 2, an isometrical view of the air regulating-ring; and fig. 3, a vertical section of so much as is needful to illustrate a modified construction of the burner.

In fig. 1, the burner-tube is shown to consist of two hollow truncated conical portions united at their smaller ends to an intermediate portion of uniform diameter throughout its length. The lower conical part has an inlet for air at its lower end through openings A, formed in a prolongation externally of uniform diameter throughout its length. The proportionate lengths of the upper, middle, and lower portions of the tube are varied to suit the gas used, as may also the apexial angles of the cones, of which the internal surfaces of the conical portions form parts. The burner-tube is represented with its several parts of the relative proportions found suitable when using ordinary illuminating gas.

There is a split ring adapted to be moved so as to constrict the effective area available for the admission of air through the openings A, but which cannot close them so fully as to cause the production of a luminous



or partly luminous flame. Screwed into the base of the burner-tube is a gas-nipple B. This air regulating-ring is intended to be used to vary the admission of air to such an extent as may be necessitated by variation in the constitution or pressure, or both, of the gas to be burnt, or by difference in the size of the mantle employed; so that the size of the flame can be increased (by reducing the air supply) to incandesce properly a large or badly fitting mantle, or reduced by a larger admission of air in order to obtain a maximum brilliance with a closely fitting or perfectly shaped mantle, or with a richer gas or a gas under lower pressure than that usually met with. The oblique splitting of the ring, as shown in fig. 2, prevents the air admission-holes from ever being completely closed, even when the width of the ring is not less than the height of the air-holes. The head or top C of the burner is detachable, and is provided with an annular series of holes approximately pear shape.

The modification illustrated in fig. 3 adheres more closely in its form and details to the original burner of De Mare, with the addition of the straight portion between the two cones, which forms the subject of this invention.

Burners according to this invention may, say the patentees, be constructed "with various forms of caps or tops, and may be advantageously used with various kinds of gas—including coal gas, water gas, and mixtures of these, acetylene, oil gas, &c. The more carbonaceous the gas, and the more explosive its character, the smaller should be the holes in the cap of the burner. The richer the gas, and the greater the proportion of air necessary to complete its combustion, the smaller should be the diameter of the intermediate straight part of the burner-tube as compared with the largest diameter of the upper conical part, and the higher should be the pressure at which gas should be supplied through the nipple C.

Incandescence Bodies for Lighting Purposes.—Nordmann, R., of Christiania, Norway. No. 18,800; Sept. 18, 1899.

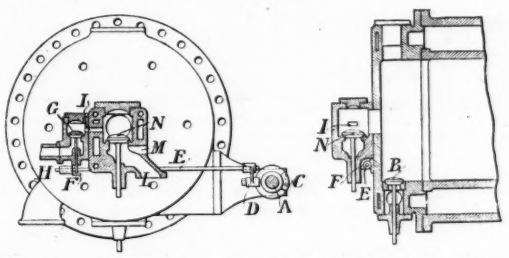
According to this invention (in the words of the patentee) "the incandescence body, made of suitable material for the purpose, is prepared for use by subjecting it to intense heat alone, without a direct flame, instead of, as heretofore, subjecting it to the action of gas, a blowpipe flame, or the like." After the material has been impregnated with ingredients proper for subsequent incandescence and dried, it is suspended on a peg, cone, or the like, made of a material capable of withstanding heat, and of a diameter corresponding approximately to that of the burner upon which it is to be subsequently used. While thus suspended, it is placed in a furnace—preferably a muffle-furnace—in such a way that it does not come into contact with any direct flames. After this, the furnace is closed; and by means of external firing, the material is heated to a temperature of about 1500° C. "Thus, by the action of the continuous and gradually increasing heat of the furnace, the material of which the incandescence body is composed is charred and oxydized, and the oxide is toughened to a sufficient extent to render it suitable for use. After being thus heated for several hours, and the furnace having been allowed to cool, the said body is removed."

Before being subjected to the heat of the furnace, the material is, of course, considerably wider than the peg or cone; but through the action of the heat, it assumes the shape of the peg or cone, and "an incandescence body of the best possible form is produced." By this system of producing incandescence bodies, it is claimed that incandescence bodies are "not only prepared with the greatest ease and safety of any desired form or shape, but their symmetry, durability, and illuminating power are increased."

Internal Combustion Engines.—Thwaite, B. H., of Westminster, and Mensforth, H., of Bradford. No. 17,654; Aug. 31, 1899.

This invention is especially applicable to motors where the gas used is of low calorific value—such as blast-furnace gas.

Near the end of the exhaust stroke of an engine working on the "Otto" cycle, the patentees propose to introduce a current of air under moderate pressure, which flushes out the products of combustion from the cylinder, and occupies the combustion chamber, forming, with such additional air as is drawn in during the charging stroke, the air necessary to support the combustion of the next charge. For the purpose of introducing the air, there are a special valve and an inlet to the combustion chamber of the cylinder; the valve being operated by a cam, by which it is opened at the proper time, admitting air at moderate pressure so as to scour out the exhaust gases—the air remaining in the cylinder, and forming part of the succeeding charge.



The illustrations are sections (on planes at right angles to each other) showing the ordinary air-admission valve and the additional air-valve according to this invention, applied at the end of a gas-motor cylinder.

A is the ordinary valve-shaft, which revolves at half the speed of the crank-shaft, and has on it the usual cams (not shown) for opening the exhaust-valve B and the gas-valve. Besides these cams, there is fixed on the shaft A another cam C, the face of which acts on a roller D mounted on the arm of a rocking-shaft E, which has another arm F under the stem of a valve G. Under this valve is an inlet from a pipe H communicating with a supply of air, under moderate pressure—just above that of the contents of the cylinder in the last portion of the exhaust stroke. When the engine is worked by low calorific value gases, the pipe H communicates with the discharge of a pump or other compressor (such as a flexible bag) worked by the engine. Above the valve G there is a lateral inlet I into the combustion chamber of the cylinder. Besides the air sent into the cylinder on opening the valve G, air also enters, during the suction stroke, by the inlet L, and gas enters by the inlet M; the mixture passing the ordinary inlet-valve N. This mixture, with the air admitted by the valve G, forms the combustible charge.

Gas-Lighters.—Juhasz, F., of Berlin. No. 24,120; Dec. 4, 1899.

This invention relates to a device for lighting gas-lamps based on the well-known principle that, with an igniting ball impregnated with platinum metallic salts (platinum black or spongy platinum), if lighting gases pass over it, it is caused to glow, and thereby ultimately ignite the gas with which it comes in contact. The igniting pellet is arranged at the top of a bell (adapted to act as a collecting vessel), concentrically surrounded by a hood; and the pellet is held over the cylinder of the gas-flame by a handle, "in such a way that the escaping gas encounters the igniting pellet, and causes it to glow so that an automatic ignition of the gas is produced."

Dry Gas-Meters.—Engelke, W., and Meyer, F., of Hamburg. No. 250; Jan. 4, 1900.

This invention has reference to dry meters, in which collapsible bellows-like gas-containers are constructed to always contain equal volumes of gas, and are connected with a multiple-way cock or valve in such a manner that it can be operated by the movement of the containers through the intervention of suitable lever, link, and toothed-wheel gearings.

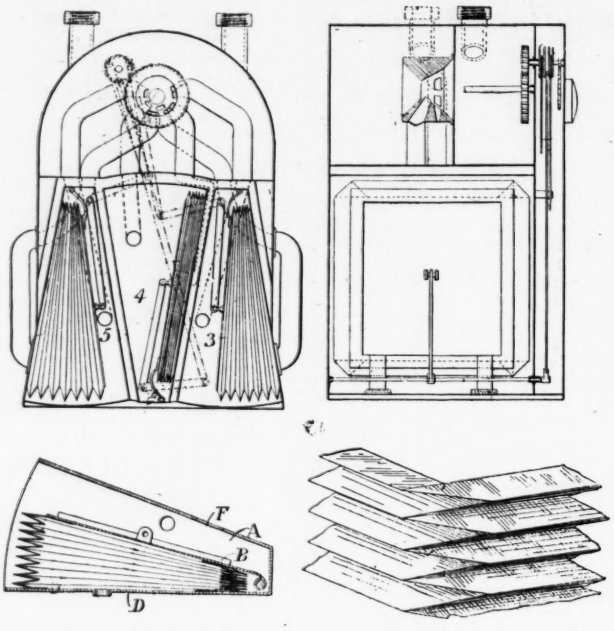
A dry gas meter constructed according to this invention is illustrated in the engraving—transverse and longitudinal sections of a complete meter, a separate view of one of the collapsible gas containers, and a detail elevation showing how the body of the container is built up at the corners.

The upper portion of the meter-casing is divided into two chambers or compartments, into one of which the gas supply discharges, and from the other a gas delivery proceeds. The multiple valve or cock already referred to is between the chambers, and is the only means of communication between the gas supply and the gas delivery. The plug of the cock (which is a three-way one) is conical, and fits, on the one hand, into the socket or seating in the cock body, and on the other is connected by a stalk journalled at one end in the meter-casing. On this stalk a toothed wheel is fixed to gear in with another wheel on a secondary axis on which discs are mounted. To these discs rods actuated by levers from the motion of the containers are at one end connected.

To attain an easy movement of the bellows-like containers in the chambers A, they are formed as shown, and made of sheet metal of trapeziform section. A collapsible bellows-like gas-container in each chamber is attached to one of its faces at one end—viz., at D—and to a sheet metal cheek or flap B at the other end; the flap being hinged at one end. The gas inlet and outlet to the container is on the side D. The body of each gas-container is made of a material (such as paper, linen, or

jute) rendered gas-tight and impervious to ammonia. It is gusseted like the bellows body of a photographic camera.

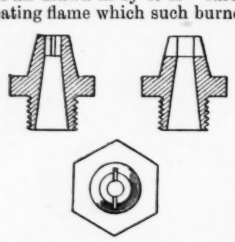
As an example of the working of a meter constructed according to this invention, supposing the gas to be entering the bellows in chamber 5 to inflate it, as the inflation takes place the plug of the valve is rotated through an angle of 60°, which will have the effect of opening the communications of the bellows in the chambers 4 and 3, and also of opening the communication between the chamber 5 and the valve. The entering



of the gas into the chamber 5 will cause the bellows in this chamber to close, and the gas contained in the bellows will be forced out gradually through the opening, which had formerly served as an entrance, to the gas delivery—the gas on being delivered passing through openings in the plug. On the discs being further rotated by the second bellows in the chamber 4 being filled, the chamber-openings are uncovered for the entrance of the gas; while for the exit the bellows-opening and two of the chamber-openings are uncovered. On the movement of the third bellows in chamber 3, a chamber-opening and two bellows-openings are again opened for the entrance of the gas, and the other bellows-opening and two chamber-openings for the exit—the cycle of operations being so that when one bellows is full, the next in order is two-thirds empty, and the next in order one-third empty.

Jet-Holes for Bunsen Burners.—Bachmeyer, A., of Westminster. No. 9565; May 24, 1900.

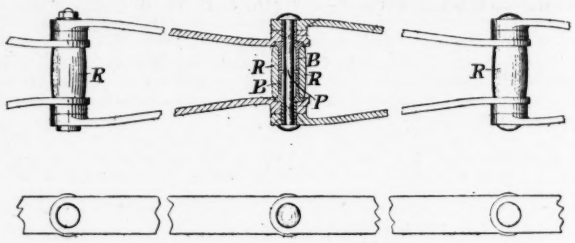
It has been found, says the patentee, that when a plain cylindrical jet-hole is employed as the outlet for the stream of gas that has to enter the mixing-tube of a burner of the bunsen kind, the mixture of gas with the air drawn in by it is "rarely so complete as to produce the highly heating flame which such burners are intended to give." His invention, therefore, relates to the formation of the jet hole in such a manner as "to cause thorough mixture of the gas and air, and thereby to produce an intensely heating flame." In the illustration is shown such a jet-hole for supplying gas to the mixing-tube—sections at right angles to each other, and a plan. The hole, as usually made, consists of a part tapering to a smaller diameter upwards, and a cylindrical upper part. A fine transverse saw-cut is run down from the point to the junction of the cylindrical with the tapering part of the hole—thus producing two lateral slits. As probably some of the gas, by lateral expansion, issues by these slits at a pressure differing from that of the gas issuing parallel to the axis, there may be produced (the inventor remarks) "eddies or other movements in the jet which promote its mixture with the air drawn by it into the mixing-tube."



Conveyor, Elevator, and other Chains.—Hunt, C., of Birmingham. No. 9769; May 28, 1900.

This invention refers particularly to the construction of the various parts forming the links of conveyor chains "so as to cheapen their construction, and render them stronger and lighter, with facilities for the renewal of those portions upon which the major portion of the wear is concentrated."

The side-links are made from stamped, forged, or cast metal—such, for instance, as tough steel or iron—with preferably the external boss at one end pierced through with a square hole, the other end having an internal boss pierced through with a round hole. There is also a recess at the inner side of the one end of each link, into which the collar of the renewable journal-pieces B sink and fit when driven home into the links. The links may be formed with flanges or provision for receiving buckets for elevators or troughs for conveyors. The journal-piece is generally a simple casting—malleable cast iron or steel—or it may be a forging. In either case, it is made separate from the links with a square neck, which fits into the hole in the links with such a fit that it requires to be driven home so as not to turn round. When the parts of the chain are assembled (as shown), a pin P is passed through all the parts and riveted at each end. In this invention, the patentee makes no claim to the



use of the roller R, as this mode of construction on solid links was secured to him by his previous patent No. 29,817 of 1896.

APPLICATIONS FOR LETTERS PATENT.

13,646.—Bower, G., "Volumetric gas-governors." July 30.
13,647.—Bower, A. S., "Production of acetylene." July 30.
13,665.—Grouvelle, J., and Arquembourg, H, "Blower or exhauster." July 30.
13,674.—Thomas, W. A., "Gas supply regulator or governor." July 31.
13,682.—Beal, W., "Supporting a smoke consumer from a gas-globe." July 31.
13,734.—Murinick, A., "Incandescent burner mechanism for street lighting." July 31.
13,742.—Bauer, F., and Rumpler, A., "Acetylene gas producers." July 31.
13,814.—Johnson, J. Y., "Manufacture of gas and coke." A communication from The Deutsche Continental Gas Gesellschaft and J. Bueb. Aug. 1.
13,899.—Lytle, H. H., "Gas-burners." Aug. 2.
13,926.—Keith, J., "Gas or air compressors or pumps." Aug. 3.
13,947.—Birch, G., "Holders for incandescent gas-mantles." Aug 3.
13,958.—Riehl, J. B., "Internal combustion engines." Aug. 3.
13 996.—Girardville, P. N. L., "Production of acetylene gas." Aug. 3.
14,026.—Keith, J., "Gas or air compressors or pumps." Aug. 4.
14,034.—Meissner, C., "Production of acetylene gas." Aug. 4.
14,066.—Diest, G. de, "Acetylene generators." Aug. 4.
14,138.—Hennings, C., "Production of acetylene gas." Aug. 7.
14,160.—Smith, E. F., "Acetylene gas generator." Aug. 7.
14,188.—Stroudley, F. W., "Gas or other engines." Aug. 8.
14,193.—Potter, W. G., "Gas-lamps." Aug. 8.
14,207.—Desjacques, G., "Carburetters." Aug. 8.
14,271.—Gut, J., "Fluid meters and the like." Aug. 9.
14,343.—Dudgeon, A. J., "Gas-engines." A communication from the Société Anonyme John Cockerill and H. Savage. Aug. 10.
14,360.—Lespinasse, C., "Production of acetylene gas." Aug. 10.
14,412.—Marcus, H., "Conveying material." Aug. 11.
14,426.—Johnston, J. P., "Manufacture of gas." Aug. 11.

Importation of Coal into Russia.—The Board of Trade have received information, through the Foreign Office, to the effect that the authorization given to Russian railway companies by the Government, to import foreign coal free of duty at all the frontiers of the Empire up to the 1st of September next, has now been extended until July 1, 1901. It is stated that this extension is due to the comparative scarcity and consequent high price of coal in Russia.

The Leamington Town Council and the Gas-Works.—At the meeting of the Leamington Town Council on Monday last week, the Town Clerk (Mr. H. C. Passman) said he had received a letter with reference to the purchase of the gas-works. At their last meeting, he had no report to make, in consequence of the Directors of the Gas Company not having met. The letter he held in his hand had been received since the last meeting of the Town Council; and if it was the wish of the Corporation he would read it. After some remarks, it was decided to refer the letter to the General Purposes Committee. The nature of the communication was not divulged; but, in a letter to a local paper, Mr. Heath Stubbs has given an indication of it. He says: "I have learned from the best authority (and quite outside the Town Council) that the Gas Company will not be advised to take any step to relieve the Corporation from the statutory obligation of taking over the gas-works. I consider I am justified in letting the ratepayers know this at once, because if any attempt is to be made to prevent the transfer of the works, it must originate with the ratepayers, and be supported by a large majority of the shareholders in the Company, and should take the form of a memorial to the Directors of the Company and to the Council."

Leeds Water Affairs.—The question of the water supply of the city was considered by the Water Committee of the Leeds Corporation at a meeting last Friday. A short time ago the Committee made inquiries, and ascertained that there was great waste of water in the city, and an appeal was issued to the public with the object of checking the waste. Figures submitted to the Committee on Friday by the Engineer (Mr. Hewson) showed that the consumption of water at present was 16¼ million gallons per day, as compared with 18 million gallons per day a fortnight ago. It will therefore be seen that the appeal has not been without effect. The Committee are still prosecuting their inquiries with regard to the prevention of waste. The recent heavy rainfall has added greatly to the amount of water in store in the reservoirs, which is now equal to a supply for the city for 93 days. At the corresponding period of last year, the quantity in the reservoir was equal to 62½ days' supply. A contract for a new 30-inch main to be laid from Eccup, by way of Arthington and Lindley Wood, to Swinsty reservoir, was adopted. The cost will amount to nearly £100,000. At present there are three mains, which are capable of conveying 18 million gallons per day to the Eccup reservoir. When the new main has been completed, the quantity of water flowing into the Eccup reservoir will be increased to 24 million gallons per day.

MISCELLANEOUS NEWS.

THE GAS POLICY OF THE MANCHESTER CORPORATION.

A Graphic Statement.

Alderman Gibson, the Chairman of the Manchester Corporation Gas Committee, has issued a memorandum to the members dealing with the finances of the department, and bearing particularly on the practice of making large contributions out of the profits of the undertaking in relief of the city rates. The memorandum, which reviews the history of the concern since it passed into the hands of the Corporation, 57 years ago, is as follows:—

The gas-works of the city of Manchester were transferred by the Commissioners of Police to the Corporation in 1843 for the sum of £198,817. Since then there has been expended on the works £2,827,124; making a total of £3,025,941. During these 57 years, the gross profit made out of the gas undertaking has been £5,227,086; so that, if the Gas Committee during this period had been permitted to use their own profits for their own benefit, the whole of the gas-works would have now been paid for without having to borrow any money at all, and the ratepayers of to-day would have had a balance in hand of £2,201,145.

Instead of this the ratepayers have no balance, but owe £1,026,456, and have to pay nearly £40,000 a year for interest upon borrowed capital, which never need have been borrowed. What has been done with this profit of £5,227,086? The sum of £2,398,471 has been paid over for city improvements and in relief of the rates; £1,017,191 has been paid in the shape of sinking fund; £752,808 has been used to write down the value of the works as depreciation; and £1,058,616 has been paid for interest on borrowed capital. So that over a million of money has been given away when it ought to have been in the gas consumers' pockets. This brings up the total amount to £5,227,086.

Members of the Gas Committee will see this is not a question of the price of gas, but a question of policy; and surely the short but startling facts just enumerated amply justify me, as Chairman of the Committee, in bringing the matter more fully before the City Council, as I propose to do by resolution.

THE FIRST STEP TO "LOW-GRADE" GAS AT SOUTHPORT.

Following in the Wake of the South Metropolitan Company.

The Gas Committee of the Southport Corporation can claim the honour of being the first to follow in the wake of the South Metropolitan Gas Company in connection with the question of the supply of gas of low illuminating quality. The Committee have made a move, the Council have endorsed it, and we hope that it will bear good fruit. The matter was introduced to the attention of the Council last Tuesday by Mr. Trounson, in the absence of the Chairman of the Gas Committee. The resolution which summed up the feeling of the Committee on the subject was contained in the minutes. It was simply this: "That it is desirable that the illuminating power of the gas be reduced." Mr. Trounson remarked, in moving the adoption of the minutes, that the question of the reduction of the illuminating power of gas had been exercising the minds not only of the Gas Committee of Southport, but of other gas supplying bodies throughout the country; and it was considered that the time for action in this direction had arrived The matter had been recently before Parliament; and objection was raised to having the illuminating power reduced from 16 to 14 candles. The result had been to bring out evidence of the highest possible scientific and practical experts; and though the opinion of these experts was heard, the proposed reduction was agreed to by Parliament. There were many reasons why the illuminating power of gas should be reduced. The great use of incandescent mantles made the present quality absolutely unnecessary and wasteful. Fourteen-candle gas would, properly used, give as much light as 20 or 21 candle gas. It was rather a remarkable thing that with one exception—that of Liverpool—Southport was the only town compelled by Act of Parliament to give 20-candle power gas. There was not the slightest doubt that the proposed reduction would result in a very considerable lowering of the price; and the public would get a very uniform quality of gas. In this matter, they would have to deal with Birkdale. But the District Council was composed of men equally as astute as themselves; and they would look at the question from a business standpoint. The motion was seconded by Mr. Irving.

Several members spoke on the subject. Mr. Karr doubted whether a reduced illuminating power would be suitable in the houses of the working class, where they had no incandescent lighting. It might answer in the streets. He moved the deletion of the minute. Alderman Booth seconded the amendment, because it was not stated to what extent the illuminating power was going to be reduced. Working people could not afford incandescent mantles. They cost 7d. or 8d. each; and this was something to a working man every few weeks or so. It might be a saving to the Corporation; but the people would have to pay for it all the same. Alderman Fisher said he had a theory that it was in the interest of the working man that they should reduce the illuminating power of gas. The bulk of the people thought that the burners commonly in use were not calculated to bring out so high a candle power as 20; and if the working man obtained gas at 2s. 6d. instead of 3s., it would be to his advantage. It was not a question of incandescent light. The Local Government Board had, he understood, suggested that they should apply for a reduction in the quality of their gas; and because they thought it time to consider the matter more fully, this resolution was put on the minutes. Alderman Threlfall said he understood that the cost of producing the extra quality of gas was very much greater than that of the ordinary gas. He wished to know if gas of 2 or 3 candle less power would serve as well as higher power gas for cooking-stoves. Several members replied that it would answer better. It was hoped by Alderman Rimmer that the Council would pass the resolution. He said that more gas was consumed now than some time ago; and the introduction of incandescent burners was an important feature. In reducing the lighting power, Mr. Karr and Alderman Booth thought they were going to do something detrimental to the working classes. In his own opinion, they were going to do something of great benefit to the working classes; and it would come out in this way—that instead of a working man burning two or three lights in a room, which were not very beneficial to his health and that of his family, he would learn to use one light, and with the incandescent light would get more illuminating power with a gas of 2 or 3 candle power less than before. If they had occasionally to renew the mantles, the cost was trifling compared with the cost of burning two or three lights. He did not think the reduction would be altogether a benefit to the Gas Committee or to the town, because less gas would be consumed. But it would be better for the general health of the town. Mr. Travis pointed out that the condition of the gas supply was very much changed from what it was at the time when the 20-candle limit was fixed by the Southport Improvement Act. The proportion of gas sold at that time for purposes other than lighting was practically *nil;* to-day it formed a very large proportion of the gas delivered by the gas-works. The Mayor (Alderman Griffiths): About one-third. Mr. Travis said there was no doubt about it that for purposes other than lighting, lower candle power gas at a lower price would be very acceptable to the users of it. He, however, objected to the form of the resolution, because he thought it would enable the Committee to reduce the illuminating power before they obtained parliamentary power to do so. The Town Clerk said they had simply an abstract resolution before them. If the Council endorsed it, further steps would have to be taken. The Mayor remarked that if there was to be a reduction of quality, it could only be by arrangement with their neighbours in Birkdale; but if that body were not favourable to the change, he did not see how it could go any further. Mr. Irving also spoke in support; but Alderman Hatch was in favour of the amendment. On an appeal, however, by Alderman Booth, Mr. Karr withdrew the amendment, which in the discussion had received so little support.

Replying upon the discussion, Mr. Trounson observed that an ordinary burner consumed 5 cubic feet of gas, and gave an average illuminating power of 20 candles. An incandescent burner used 4 feet of gas, and gave a 50-candle power light. The Committee were only following the Germans in this matter; and the sooner they took a leaf out of the German book, the better it would be for the gas consumers. A return of the German Continental Gas Company with regard to the growth of their burners last year showed that the increase of incandescent lights (including the supply to the working class population) was 91·64; ordinary burners, 7·95; and argands, 0·41. With reference to mantles, no doubt the question had become revolutionized recently because the greatest mantle firms had reduced their prices by 50 per cent., and in Germany the gas suppliers could buy them from 1d. to 2d. each. Personally, he did not see why mantles could not be put on the Southport market as in Berlin, Munich, or in any other place.

The minutes were adopted.

WARRINGTON CORPORATION GAS DEPARTMENT.

The Annual Report of the Engineer.

The Gas Engineer of the Warrington Corporation Gas Department (Mr. W. S. Haddock) has issued his annual report. Referring to the increased cost of coal and cannel, he says the average price for the present year is nearly 50 per cent. in advance of last year's prices. The increased receipts from residual products, owing to better prices and the large increase in the output of gas, have enabled them to carry on the works with profit. In the contracts entered into for next year's supply of coal and cannel, the prices are again advanced 50 per cent. upon this year's price, or rather over double the price paid for last year's supply. He thinks it probable that, by postponing the renewals and repairs of buildings and plant where not absolutely necessary, together with the increased receipts from residuals, the works will be carried on in the coming year without loss. An early reduction in the price of gas was promised last year; but owing to the present inflated prices for raw material, it is not advisable to make any alteration at present. The increased make of gas is 32,034,300 cubic feet, equal to 10·6 per cent., upon last year's production. From statistics supplied by Mr. Haddock, it appears that the largest make of gas in one week was 10,240,000 cubic feet—viz., the week ending Dec. 9. The largest consumption was in the week ending Dec. 24, when it amounted to 10,491,700 cubic feet—some 250,000 cubic feet more than the largest make for the same period. The smallest make and the smallest consumption was in June. The average illuminating power of the gas is given at 18·41 candles. The wages cost per 1000 cubic feet of gas made was 9·985d. against 9·742d. for the previous year. The average price of coal and cannel was 10s. 5¾d. per ton, against 7s. 1½d. for the preceding year. The expenditure amounted to £51,327, as compared with £36,010; and the receipts to £67,938, against £58,391.

A QUESTION AS TO GAS STORAGE AT MIDDLESBROUGH.

Lay Opinions v. Expert Advice.

There was a protracted discussion at the Meeting of the Middlesbrough Town Council last Tuesday on the subject of the gas storage accommodation at the gas-works. The situation was described at length to the Gas Committee the previous day in a communication by Alderman Hugh Bell (accompanied by a letter resigning his position as Chairman). The only absolutely trustworthy holder, he said, was No. 4, containing about 1 million cubic feet. This was inadequate, considering the winter production exceeded 2½ millions a day. They had been able to carry on the works from two circumstances—(1) the fact that the water-gas plant enabled them at a pinch to make gas with sufficient rapidity to keep up the supply; and (2) they had been able to rely to some extent on No. 5 holder, of which one lift was at their disposal. The position for the coming winter would be improved so far as the new retorts would assist in production, against which was to be placed the increased demand. Mr. Corbet Woodall, their Consulting Engineer, had expressed himself strongly on the necessity for additional storage. He concurred with him in urging that a new holder be erected before any attempt to improve

No. 5 was made. Mr. Woodall attended the meeting; but a motion was finally carried, deciding not to erect a new holder until Mr. Woodall had reported on what was needed to put No. 5 into order.

At the Council meeting, Dr. Hedley moved, as an amendment, that the Committee proceed at once to erect a new holder, leaving No. 5 untouched for the present. He regretted the majority had voted against the opinion of their Consulting Engineer. They were getting to the starvation point; and they had Mr. Woodall's opinion that it was dangerous to act in the manner they had done. Mr. Ward seconded the amendment. Although, he remarked, they had not Mr. Woodall's report on the No. 5 tank, they had it from him that it was the foundation that was at fault. Alderman Jones described the vote against Mr. Woodall's advice as an indication they desired no longer to retain his services. Mr. Woodall, he said, had told them he must resign. No. 5 holder might be improved; but the work would take six or eight months, or even twelve; and they could not do without it next winter. Even then they would never be sure there would be no further sinkage. The speakers who followed held divided views on the question. The discussion was terminated by Mr. Roberts, who said the department possessed 1,100,000 cubic feet of storage in No. 1 holder, and 700,000 or 800,000 cubic feet in No. 5—nearly 2,000,000 cubic feet. Taking this into consideration, as well as the water-gas plant, and the electric lighting plant (which would make some difference in the demand for gas for two years at least), he felt there was no reason for haste.

In the end, 15 members voted for the Gas Committee's minutes being adopted, and only 9 for proceeding with a new holder.

MACCLESFIELD CORPORATION GAS COMMITTEE AND THE PRICE OF GAS.

No Increase to be Made.

At a recent Meeting of the Gas Committee of the Macclesfield Corporation, Mr. Shaw moved that the price of gas be increased from 2s. to 2s. 8d. per 1000 cubic feet. He said he did so in view of the present price of coal, and the large decrease in profit which might be expected in the ensuing twelve months. It had been ascertained from the Gas Engineer (Mr. Ernest L. Newbigging) that the profit was likely to be quite £2000 less than in the past financial year, owing to the enhanced price of coal. Seeing that this was the case, and that the rates would suffer in consequence, he thought there should at least be a small addition to the price of gas. He (Mr. Shaw) and those supporting him were not quite convinced that this was the best thing to do; but in order to bring the matter before the Council, and for other reasons named, he submitted the motion. Mr. F. W. Isherwood said that for the sake of discussion, and in view of the information possessed by members of the Committee and given by the Engineer, he would second the motion. The Engineer had brought before them a list of 52 towns where gas had been raised recently from 2d. to 10d. per 1000 cubic feet; and largely on that account he (Mr. Isherwood) thought the price should be raised in Macclesfield. An amendment was proposed by Mr. Whitmore that the gas remain at its present price until the end of the financial year (March 31, 1901) when the matter could be reconsidered. He thought the figure was sufficiently high now. They had 6000 tons of coal at the old rate, and the benefit of this should be given to the consumers. He also considered that if they increased the charge, the consumption of gas would go down materially. After some discussion, the amendment was carried.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Half-Yearly Report and Accounts.

At the 91st Ordinary General Meeting of the above-named Company on the 11th prox., the accounts presented will show that the Company's business continues to progress satisfactorily. The quantity of gas sold in the six months ending the 30th of June was 1,294,856,000 cubic feet; being an increase of 59,387,000 cubic feet, or 4·8 per cent. on the corresponding period of 1899. The revenue from the sale of gas amounted to £111,974; stove and meter rentals, to £6861; residuals produced £63,369; and the total receipts were £184,335. The expenditure on the manufacture of gas was £108,517 (coals costing £63,649, as compared with £50,495); on distribution, £10,674; and on management, £5118—the total expenses amounting to £134,461. The balance carried to the profit and loss account was therefore £49,874; and the amount available for distribution is £71,948. The half-year's profit will allow of the payment of the usual dividends on the various classes of stock, and leave a balance of £6905, which, added to the amount brought forward, makes £28,851 to the good. The Company's coal contracts, which expired on the 30th of June, have been renewed at a considerable advance on last year's prices. Towards meeting this extra expenditure, and also the additions made to the workmen's wages, the Directors have found it necessary to increase the charge for gas by 4d. per 1000 cubic feet from the 1st ult. The portions of the accounts relating to the manufacturing operations of the Company show that 103,910 tons of silkstone coal and 26,536 tons of cannel were carbonized in the past half year; the estimated quantities of residuals produced being: Coke and breeze, 78,211 tons; tar, 8162 tons; ammoniacal liquor, 3,729,800 gallons.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Half-Yearly Report and Accounts.

At the Meeting of the above-named Company next Saturday, the Directors will report that the increase in the quantity of gas sold in the six months ending the 30th of June last, as compared with the corresponding period of 1899, was 34,478,800 cubic feet, or equal to 13·62 per cent. The Company's coal contracts terminated in March last; and consequently a considerable portion of the quantity used in the past half year was bought at the high rate then ruling, and since maintained. The result has been an increase in the cost of 3s. 7½d. per ton, and a total additional expenditure for materials used in manufacture of £6161 4s. 10d. During the whole of the year on which the Company have now entered, the coal used will have to be paid for at the higher rate; involving an addition of £19,792 to the expenses. The Directors have abstained thus far from raising the price of gas; and they have decided—following the policy they have repeatedly avowed, of considering the interests of consumers equally with those of shareholders—to continue the present rates till Christmas. It will, however, be necessary to make some increase from the end of the year; but the consumers are assured that the amount will be as small as circumstances will admit. A tender for building new offices in High Road, Tottenham, has recently been accepted.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £43,024; the rental of meters, fittings, and stoves, to £3606; and the sale of residual products, to £6043—the total receipts being £52,749. The expenditure on the manufacture of gas was £33,025 (coal costing £11,677, oil for enrichment of carburetted water gas £8165, and coke used in making this gas £2369); on distribution, £6333; and on management, £2060—the total expenses being £45,029. The balance carried to the profit and loss account is £7720; and the sum available for distribution is £8549. To this has been added £302 from the reserve fund; making a total of £8851. This enables the Directors to recommend the payment of a dividend at the rate of 6 per cent. per annum on the "A" consolidated stock, and of 4½ per cent. per annum on the "B" stock. Under the supervision of Mr. A. E. Broadberry, the Engineer and Manager, 13,032 tons of coal, 196 tons of cannel, and 547,485 gallons of enriching oil were used in the production of 307,554,000 cubic feet of gas, of which 287,535,000 cubic feet were sold, and 292,735,000 cubic feet were accounted for. The estimated quantities of residual products were: Coke, 7936 tons 16 cwt. (of which 2097 tons 16 cwt. were used in the manufacture of coal gas, and 3344 tons 12 cwt. in producing carburetted water gas); breeze, 2024½ chaldrons, of which 1408½ chaldrons were used; tar, 218,124 gallons; and ammoniacal liquor, 3674 butts. The sulphate of ammonia made was 121 tons 1 cwt.; and 142 tons 7 cwt. were sold—the difference coming out of stock.

CROYDON COMMERCIAL GAS AND COKE COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Offices, Katherine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. J. Russell) read the notice calling the meeting; and the report and accounts—summarized in last week's issue—were taken as read.

The CHAIRMAN, in moving the adoption of the report, said the first thing he had the great pleasure to refer to was the very satisfactory—and, he might say, rather extraordinary—increase of 16·98 per cent. in the consumption of gas over the corresponding period of last year. This was a maximum increase that had never before been reached in the history of the Company. The previous highest was nearly 16 per cent. in 1874; but since then they had had nothing so high. This great increase of 16·98 per cent. had, of course, arisen partly from the growth in the building trade in and around Croydon, and more especially from the prepayment system of gas supply, which had been taken up very largely indeed during the half year. The adoption of gas cooking-stoves was also greatly on the increase. They had had several lectures on the subject; and these had proved most beneficial, and had been the means of letting out a large number of stoves—both cooking and heating. Regarding the accounts, the capital received during the half year had amounted to £22,018 19s. 6d. from the sale of £5000 of "B" stock, £2500 of 5 per cent. debenture stock, and a call of £2 per share on the ordinary "C" shares, or Carshalton capital. This had given them a premium of £9518 19s. 6d.—showing that the Company were still appreciated by investors who wished to put their money into a safe concern. The capital expenditure had amounted to £11,184. They had purchased four new tanks for conveying oil, instead of paying for the hire of tanks, as they found it would be much cheaper to have their own. Then on water-gas plant (which he mentioned at the last meeting it was intended to extend), they had spent £930; on a new purifier-roof, £145; on new pipes, £152; and on wages for the foundation of the purifiers, £268. New mains and service-pipes and work connected with the distribution came to £4612. On new meters the outlay was £459; new gas-stoves had cost them no less than £3687; and for new house fittings £309 had been spent. Coming to the revenue account, he said that in the sale of gas to private consumers in the Croydon district there had been an increase of £5859; in the Carshalton district £1010; and in public lighting and under contracts £843—making a total of £7712 increase. In the rental of meters, they had obtained £127 more; and in the rental of gas-stoves £268 more. Respecting residual products, an additional £4750 had been received for coke; it having made 2·89d. more per cwt. than in the corresponding period. For breeze there had not been such an active demand; and they had not realized so much for it by £31. In regard to tar, they had rather a big stock at the beginning of the half year; but it was now going out much better than it had been doing. They received an additional £538 on this product, or 0·17d. per gallon, which was rather comforting. Sulphate of ammonia had increased by £86, which was 20s. 2d. per ton more than for the corresponding period. This bye-product had been rather stagnant in price for some considerable time. Altogether the total realized for residuals had been £5405 more. As to the expenditure on revenue, £7189 more had been spent on coal and oil; but they had carbonized 3445 tons of coal more, and used 72,580 gallons more oil. But this was a natural increase due to the increase in the sale of gas. Purification had cost £331 more; repairs of mains, &c., £266 more; gas-stoves £226 more; and lighting and repair of public lamps £82 more. Rates and taxes were £404 more. This had partly arisen through the increase of 4d. in the income-tax for the past three months. The item of superannuations was a little more, but they would be less, as since the last meeting the Company had lost a very old servant, Mr. Kemp, and Mr. Waller, who for many years was assistant to the manager at the works. Altogether they had a balance on revenue account of £5508 more than in the corresponding period. As the shareholders were aware, the

Directors had given notice of an increase in the price of gas from Oct. 1 next of 2d. per 1000 cubic feet. He knew that it was thought by some that they ought not to have done so; but he considered those who were on the Board were better able to judge of whether or not they should increase the price than those who were outside, and criticized the Directors without knowing all the facts of the case. He could assure the proprietors that the Board had not done this without grave consideration, and without very great reluctance; and from the few figures which he would give, it would be seen that what they had decided to do was perfectly right. Unfortunately, they had to make fresh contracts for coal and oil as from June 30, and, of course, like other companies, at a much higher price. Altogether the increases added 9d. per 1000 cubic feet to the cost of making gas, or about £24,000 per annum. With the excellent half year they had had, however, and having some coal in store, which took them on for a little time, the Directors resolved not to make the change until Oct. 1. He thought the consumers should take this into consideration, and not think harshly of the Directors. Since 1894, they could have paid the shareholders, under the sliding-scale, 1¾ per cent. more than they had done; but they had given the consumers the benefit of it. He therefore thought the consumers should not be unmindful of this mercy. The Board had taken into account the balance of £9466, which would be carried forward, after paying the dividends on this occasion; and the 2d. would bring in about £1670 on the quarter, towards making up the £12,000 which they would have to pay in the six months in consequence of the increase in the price of coal and oil. The amounts mentioned did not make up the deficiency; but the Board looked to the natural increase that undoubtedly would come to make it up. They sincerely trusted the increase in price would be only temporary. He believed it was the opinion of many who were better able to judge than he was that the increase in the price of coal would not last much longer; but this the Directors knew was certain, that for twelve months from last June they were bound by their contract for coal to the price they had made. Therefore any reduction would not now affect them, unless they were fortunate enough to get the contractors, as they did once before, to cancel the old contract, and give them a new one. But they could scarcely hope to realize that. Comparing the proposed increase of 2d. with the advances of other companies, he said that one journal in the town had quoted a certain worthy Chairman, and had held him up as a pattern to other chairmen of gas companies. But the gentleman referred to had, in the case of his own Company, put up the price 3d. at Lady-day, and 4d. at Midsummer. Then the Crystal Palace Company (which was another of Mr. Livesey's Companies) raised the price 2d. in March and 2d. in June—making it 2s. 10d., the same as it would be in Croydon with the increase in October. Then the West Ham Company had increased their price by 4d.; the Redhill Company, by 4d.; the Richmond Company, 4d.; the Sutton Company, 6d.; the Mitcham and Wimbledon Company, 7d.; the Caterham Company, 4d.; and the Dorking Company, 4d. Thus, in their own case, he considered the Directors had been very moderate; and he believed when the consumers had thoroughly taken into account the increase in the price of coal and oil, they too would think the Directors had been very lenient in only raising the price by 2d. It was true that they had large insurance and reserve funds; but he for one was loth to touch such funds for this purpose, unless it was merely a spasmodic increase in the price of material. They might, however, have to do so slightly for the next half-yearly dividend; but he hoped not. After paying the dividends at the rates they had done for a considerable time now, they had a balance of £9466 to carry forward. He thought they ought to congratulate themselves upon being in such a happy position.

Mr. T. Rigby seconded the motion.

Mr. H. D. Ellis thought the Directors might be proud as well as happy in having such admirable accounts as they had on this occasion to submit to the proprietors; and, personally, he was grateful to the Board for the attention they had given to the business to produce such results. The pith of the matter dealt with in the Chairman's speech was the rise in the price of the gas. He felt confident that every reasonable shareholder—in fact, all the shareholders—would thoroughly approve of the action of the Board in resolving to increase the price 2d. For his own part, he was only astonished at their moderation. Everybody who knew him (Mr. Ellis) was aware that he had been an out-and-out advocate of cheap gas. He had always endeavoured, in all companies with which he had been connected, to preach the wisdom of selling gas as cheaply as possible. But there was a point at which they could go no lower, and must raise the price. It was absolutely quixotic to try to sell gas cheaper and cheaper when they had a certain loss facing them in the future. He ventured at a meeting the previous week to say something on this point; and he was much scolded in print for his words. But he was so hardened that he came up smiling again; and he stuck to his opinion still. With such an advance in the price of material, he would venture to say most respectfully that, as time went on, if the Board saw (as he hoped they would not see) that 2d. was not sufficient to enable them to tide over the enormous rise in the price of coal, they would have the unanimous support of the shareholders if they did not shrink from taking such further measures as might seem prudent. It was all very well for writers in local newspapers who were not thoroughly acquainted with gas affairs to talk of large reserve funds. Perhaps they did not know that reserve funds were not applicable to the matter; and such funds must not be lightly frittered away.

The Engineer (Mr. J. W. Helps), in reply to a question, stated that the unaccounted-for gas was only between 2¾ and 3 per cent.

The motion was unanimously agreed to.

Mr. Corbet Woodall moved the declaration of dividends at the rate of 14 per cent. per annum on the "A" stock, 11 per cent. on the "B" stock, and 9 per cent. on the "C" and Carshalton capital. He said he would not have made any observations upon this motion, had it not been for the remarks of Mr. Ellis. He could not help feeling a little at issue with Mr. Ellis in some of the observations he made. To him (Mr. Woodall) it was a matter of most sincere regret that they had had to raise the price of gas at all. When he said "to him," he spoke of himself as one of the Board of Directors. They were all very sorry indeed that such a course had been necessary; but at the same time, they knew that it was necessary, having to face an increase of something like £25,000 in the coming year, and amounting, as had been said, to about 9d. per 1000 cubic feet of gas sold. It was perfectly impossible to meet this out of the ordinary revenue in the past half year. The increase in the gas revenue, large as it was, had been entirely absorbed by the increase in the cost of the raw material; and the increased balance had come from the greater value of residuals. His (Mr. Woodall's) feeling was that the shareholders should be, and he was quite sure they were, willing to share with the consumers the loss attending a condition of things such as they were experiencing now. The Directors had accumulated a certain amount of reserve fund; and out of that, if necessary, they would return something to the consumers, in order to make the increase in price as low as they possibly could. They had put the money by out of what might have been divided to a large extent. But they had put it by so as to have the wherewithal to meet a case of this sort; and no doubt, to an extent, it would be used for that purpose, should it be necessary. A very good reason for raising the price of gas now, although they had such an admirable balance-sheet, was that it might prevent a larger rise at a later date.

Mr. Samuel Spencer seconded the motion, which was agreed to.

Mr. Baynes moved a vote of thanks to the Chairman and Directors; and Mr. Ellis seconded it—the latter gentleman remarking that he entirely agreed that the object of the reserve was to make good the dividends in bad years.

The motion was heartily endorsed.

The Chairman, having responded, proposed, in graceful terms, a similar complimentary vote to the Secretary and the Engineer and their respective staffs.

Mr. W. Cash, F.C.A., seconded the motion, which was also warmly approved.

Suitable responses having been made by Mr. Russell and Mr. Helps, the proceedings terminated.

BROMLEY GAS CONSUMERS' COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday, at the Bell Hotel, Bromley—Mr. Alex. Dickson in the chair.

The Secretary (Mr. H. W. Amos) having read the notice calling the meeting, the report and accounts, of which an epitome appeared in the "Journal" for the 7th inst., were taken as read.

The Chairman, in moving the adoption of the report and accounts, said he thought a satisfactory feature of the half-year's working was that they had been called upon to make 8 million cubic feet of gas in excess of the quantity produced in the previous six months, and 13 millions over and above the quantity made in the corresponding period of last year. It was always desirable that they should beat their best records; and this increase was a very welcome proof of the Company's inherent power of growth, notwithstanding certain other systems of lighting. Yet it was unfortunate that, in the very half year in which they had had this large increase (which, had it continued, would have brought them in a sum of profit at the old price which would have enabled the Directors at no distant date to approach the consumers with proposals for lowering the price), they found themselves confronted with a sudden and very substantial advance in the cost of coal; so that, in place of the other prospect, they were actually driven, much against their will, to increase the price of gas. Such were the experiences of commerce! Various causes had operated to bring about this great rise in the price of coal. It was divulging no secret to say that, towards the close of last quarter, many of the Durham, and some of the Yorkshire, collieries, had so fully contracted their sales for the twelve months in advance, that they simply answered inquiries for coals by saying: "We really have no coal to offer you." And it was no exaggeration to say that there was practically no coal in store at that time at the pit mouth or elsewhere. The great demand had not only depleted but exhausted stocks. The iron trade, with which the fortunes of the coal trade were so closely allied, was in unwonted activity at high prices; skilled labour was everywhere in demand; and, indeed, the trade of the whole country was immersed in an activity and prosperity which had seldom been previously known. In such circumstances, it was not surprising that the coalowners should seek to share in the general improvement; but no one was prepared for a rise of nearly 300 per cent. in the price of coal in about two years. It was not an easy matter to unravel the mystery of how this had come about. Its very suddenness and the extent of it were astounding. No doubt the advent last February of foreign buyers of gas coal, in enormously increased quantities, was very prejudicial to the home customer. When in the North with their Engineer (Mr. W. Woodward) some months ago, trying to pick up the best possible bargains, he learnt that agents from two foreign countries (which were named to them) had been over, and announced that they were buyers of largely increased quantities of coal. One was desirous of buying from our fields the usual year's supply for a large Continental gas-works, and to discontinue using Belgian or German coal. The agents were informed they could have the coal; but the price would be 16s. 6d. per ton, instead of 8s. 6d. They took only a few days to consider the matter, and then accepted these onerous terms without much further discussion. These prices, having been made, were then adopted by the coalowners as ruling the home market also. Without some kind of mutual understanding among the coalowners, without the prevalence of a great demand, and the entire absence of stocks, such a price could not have held for any time. But as it was, so great was the demand that a sale below the price mentioned, and in the case of the best qualities at something higher, was simply declined. The Chairman proceeded to refer to the suggested export duty on coal, and to other matters associated with the subject—particularly referring to the absenting of miners from their work, and its effect upon the output of coal. He said he alluded to this topic at such length in the hope that the consumers would recognize that the rise in the price of gas had resulted from causes over which they had just as much control as the gas companies—if either of them had any—and that it was not the gas companies but others who were profiting. It should also be remembered by the consumers that only 10,000 cubic feet of gas could be produced from a ton of coal; and, therefore, a rise of 10s. per ton meant an additional cost of 1s. per 1000 cubic feet. Part of the gas made was supplied under contracts which could not be disturbed, as, for instance, the contract for public lighting, which was upon terms that could not be disturbed for a

few years. The town in this case had the advantage, and quite fairly so. But this rather increased than lessened the trouble of the Directors. The Company, however, would get some benefit from the sales of coke as a set-off. He ventured to hope that those present would see from what he had said that the Board fully realized their responsibilities at this juncture both to the shareholders and to the consumers; and he trusted that time would show their arrangements had guarded both interests. In the first instance, they had fully determined to have a winter stock of coal, whether the coalowners had one or not, and to run no risks. The Directors also decided that, whatever the price, quality should be maintained. Hence they had bought coal which would enable them to do as heretofore, though they necessarily had to pay the full price for it. Referring to criticisms in the Press respecting the difference in the charges to ordinary and prepayment consumers, he explained the reasons for the additional charge of 8d. per 1000 cubic feet in the case of the latter. Turning to the accounts, he said the large advance in the consumption of gas gave an increase in the rental of £2002 as compared with the June half of last year, and from the sale of coke they had derived an additional £1567. Tar and sulphate had also yielded better results; and with other small advantages, their net rental increase was £3800. On the other hand, the charges for coal had increased by £1940; for repairs of works and in the amount written off for depreciation, by £252; for repairs of mains and services (this work had been in the half year of an exceptional character, and the expenditure was not likely to be recurrent in the same proportion), by £315; for wages, by £167; and in other items, by some £346. Regarding the matters in dispute between themselves and a neighbouring Company, they had, he said, advanced a stage.* Judgment had been recorded, and in terms against which the Directors were strongly advised by Counsel to appeal. In accordance with the rule, they had paid the taxed costs in the first Court to the plaintiff Company; and they had also drawn a cheque for their own Solicitor's charges in the matter, and thus cleared their accounts of these items. After providing for the payment of the dividend at the same rate as heretofore, there would remain a balance of £2571 to be carried over to the next accounts. He thought the proprietors would agree with him that this was a very satisfactory result, having regard to the short period that had intervened since they were dividing their profits to the fullest extent they possibly could. In conclusion, he mentioned that during last half year the Board bought coals at an advanced price; but, having used part of them, they had in stock at Midsummer some of the later deliveries under last year's contracts. So the benefit of the lower prices under last year's contracts would, *pro tanto*, pass to the present year's trading.

Mr. B. H. Latter seconded the motion, which, after a few questions had been answered, was unanimously carried.

A dividend at the rate of 12 per cent. per annum upon the original 10 per cent. capital, and of 9 per cent. upon the ordinary 7 per cent. capital (both subject to income-tax), was declared.

The thanks of the shareholders were accorded to the Chairman and Directors and officials; and, in responding, the Chairman made special allusion to the anxious times they and their Engineer had experienced during the half year.

HORNSEY GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Friday, at the Offices, No. 63, Chancery Lane—Mr. John Drew, the Chairman of the Board, in the chair.

The report and accounts were taken as read. These showed that comparing the sale of gas in the half year ending June 30, 1899, with the same half year in 1900, there was an increase of 22¼ million cubic feet, or 16¾ per cent. The revenue yielded a profit of £8300; and the price of gas was 3s. per 1000 cubic feet. The initial sliding-scale figure is 3s. 9d. per 1000 cubic feet; and this would permit of an increase of 2¼ per cent. per annum dividend on both classes of shares. The report stated that a quotation for the 7 per cent. consolidated stock of £72,500 had been granted by the Stock Exchange; and the regret of the Directors was expressed at the loss of an old and valued colleague, for many years Chairman of the Board—Mr. William Peter Bodkin.

Mr. Drew spoke of the satisfactory position of the Company, and moved that the report and accounts be received and adopted.

Sir Harry Poland seconded the motion; and it was carried unanimously.

Resolutions moved by the Chairman, and seconded by Mr. E. T. E. Besley, Q.C., and by Mr. John Miles, were likewise adopted for payment of a dividend on the preference stock and of dividends at the rate of 12 and 9 per cent. on the 10 per cent. and consolidated stocks respectively.

Thanks were then voted to the Directors and to the officers and staff, and the proceedings terminated.

AN INQUIRY AS TO THE PRICE OF GAS AT HARROW.

A Curious Provision and its First Application.

In the Harrow and Stanmore Gas Act of 1894, the following provisions are applied to the selling price of gas: From the quarter-day next after the passing of the Act, the standard price is fixed at 4s. per 1000 cubic feet for gas supplied within a radius of one mile from the King's Head Hotel in Harrow. For every penny upon this price, up or down, the original capital is to have 5s. per cent. allowance; and the 7 per cent. capital 3s. 6d. per cent. It is provided that, as from the same period, the price to be charged by the Company within this radius shall not exceed 4s. 3d. per 1000 cubic feet until the Company shall have for the first time paid a dividend on their "A" capital of 9½ per cent., and on the "C" capital, old and new, of £6 9s. 6d. per cent. per annum, "unless the cost to the Company per ton of coals delivered at their works shall, in the opinion of a competent and impartial Referee, having a practical knowledge and experience in the manufacture and supply of gas (who shall be appointed by the Board of Trade upon application by the Company, or by the Harrow Local Board), justify an advance beyond the said price of 4s. 3d. per 1000 cubic feet; and such advance of price, and the date of its commencement and the period of its duration, shall be determined by the said Referee." The first inquiry under this provision has recently been held; the Company having applied for permission to raise the price of gas 3d. per 1000 cubic feet from Midsummer last in the one mile radius from the King's Head Hotel. The Referee appointed by the Board of Trade was Dr. J. S. Haldane.

The Company were represented by their Engineer (Mr. J. L. Chapman), and the opposition of the Harrow District Council was conducted by Mr. R. H. Fisher. The Referee opened the proceedings by reading his credentials; and then Mr. Fisher desired to know how the matter stood with reference to the district outside the prescribed area. He said it was generally held that if the Company did not get consent to raise the price in the prescribed area, they could not do so in the outside area, and so it would affect a great number of people who were not then represented. Mr. Chapman maintained that the matter did not apply to the outside district; the Company could charge what they liked there. The Act of Parliament was read by the Referee, who said the question was not before him; and it was therefore unnecessary for him to express an opinion, which would be of no value, as it was a legal question.

The preliminaries having been disposed of, Mr. Chapman stated the case for the Company. He said that in 1894, when they obtained their Act of Parliament, the contract price of coal was 15s. 11d. per ton; now it was 22s. 11½d. per ton—a rise of 43 per cent., or 7s. 0½d. per ton. These were the prices for coal delivered at the Harrow Metropolitan Station; and after that there was a further cost of 2s. per ton for cartage. The average quantity of gas sold for each ton of coal carbonized was 9500 cubic feet; and the increase of 7s. 0½d. per ton of coal therefore gave an increase of 8·84d. per 1000 cubic feet of gas. Against this, there had been an advance in the price of coke since 1894 of 2s. 3d. per ton. The average sale of coke, deducting the quantity used in the furnaces, was 10 cwt. per ton of coal carbonized, which showed an increase of 1·44d. per 1000 cubic feet of gas sold. Tar had also increased 0·68d. in price per 1000 cubic feet of gas sold; while the price of sulphate of ammonia had remained practically stationary. After making allowance for all these increased returns for residuals, the net additional cost of coal to the Company per 1000 cubic feet of gas sold was shown to be 6·72d. In the autumn of 1893, a coal strike had affected the pits from which the Company drew their supply, and seaborne coal had to be purchased at high prices. Part of these high-priced contracts remained in operation during the early part of 1894, increasing the cost of coal over that year by 17d. per ton or 1·79d. per 1000 cubic feet of gas sold. By deducting this from the 6·72d., the net increase in the cost of production was found to be 4·93d. per 1000 cubic feet. The rise in coal from 1896 to the present year was 6s. 11½d., which equalled 6·15d. per 1000 cubic feet of gas sold. With the price of gas at 4s. 3d. per 1000 feet, the Company, under their sliding scale, were empowered to pay 9¼ per cent. dividend on the "A" shares, and £6 9s. 6d. per cent. on the "B" guaranteed shares; whereas the dividends paid up to the end of December, 1897, were 7 per cent. on the "A" shares and 6 per cent. on the guaranteed shares. For 1899, the dividends paid were 8 per cent. on the "A" and 6 per cent. on the guaranteed shares. The present coal contract was for the next twelve months. They did not now use much water gas, for the price of oil had gone up so that it did not pay. He had, however, made a contract for oil at 5½d. per gallon from September to March.

Mr. Fisher asked if the present prices of gas at Harrow—viz., 4s. 3d. and 4s. 6d.—were not high? Mr. Chapman: Yes. Mr. Fisher: Very high? Mr. Chapman: No, not compared with many other places, which were even higher. He added that it must be borne in mind that they had no water to carry their coal. Last year the Gaslight and Coke Company got their coal for 11s. per ton; while at Harrow it cost 18s. The Gaslight and Coke Company charged 3s. 6d. per 1000 cubic feet; the Harrow Company asked for 4s. 6d. In reply to a question, Mr. Chapman said they only asked for a rise for twelve months. Mr. Fisher pointed out the great leakage the Harrow Company showed year by year. Mr. Chapman explained that they had 52 miles of mains to look after; and other Companies adjoining had even a larger percentage.

Mr. Fisher then went into figures to show that the relative position of the Company to-day was even better than in 1894, when they obtained their Act. If 4s. 3d. was sufficient then, as the Act presupposed it was, for it fixed the standard at 4s., then 4s. 3d. should be sufficient now. The Company was considered by many to be over-capitalized.

The Referee asked Mr. Chapman to explain why coals cost more at Harrow than in London. Mr. Chapman said the large London Gas Companies had the great advantage of sea-borne coal. The Harrow Company had nothing but the railway. They had looked into the question of the canal; but it was too far away, and would cost more than the railway. Mr. Fisher pointed out that a new railway was being constructed quite close to the works. Asked as to the amount of capital per 1000 feet of gas sold, Mr. Chapman replied that at Harrow it was 29s. 1d.; while in the case of the Gaslight and Coke Company it was 12s. 6d., and in the case of the South Metropolitan Company 8s. 10d. Some £2000 had been spent in slot meters. The Referee asked the reasons for so large a capital. Mr. Chapman replied that they had bought up two Companies—one costing £18,000, the other £10,000—and their district being a large one, they were constantly laying new mains to meet the wishes of local authorities and private consumers, which mains were unremunerative at present. Other companies had raised the price, having the power to do so without making application to the Board of Trade. He should hardly think there was another company in the kingdom in the same position. It was quite unprecedented for a company to have to get consent to raise the price. Mr. Fisher quoted the charges of other companies in Middlesex; and out of thirteen companies, only three were charging more than Harrow.

A consumer of gas under the slot meter system (Mr. Short) said he was supposed to get 17 cubic feet for a penny. If the Company were empowered to raise the price, he would only get something like 13 feet. Why, he asked, should the Harrow Company charge 4s. 6d., when London only charged 3s.? Let the shareholders drop their dividend a bit; 6 per cent. would be very good interest. They were grabbing everything. He uttered his protest against any rise. Mr. Chapman replied that a good many other companies had not raised the price of gas, but then they had large reserve funds. Harrow had none. He pointed out that his figures showed that, after deducting the increased price for residuals, the cost per 1000 cubic feet of gas was 5d. more; but the Company were only asking for 3d. They did not go for the highest dividends; and if it had not

* See "Journal," Vol. LXXIV., p. 434.

PREPAYMENT METERS.

CHANGING PRICE.
MOST SIMPLE.
NO WHEELS OR PARTS REQUIRED.

THIS METER CAN BE ALTERED *in situ.*

INSTRUCTIONS.

The Brass Plate has holes around its edge, numbered; these indicate the feet delivered for the Coin used
To set the Meter, note Figs. I., II., III., IV.

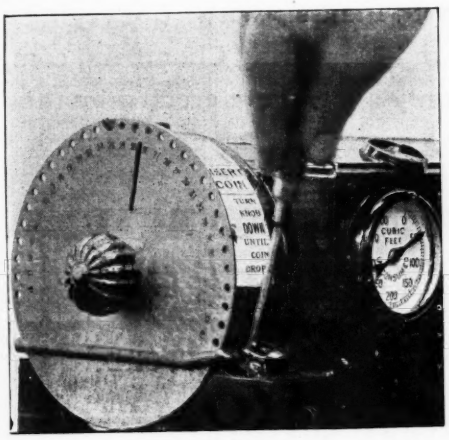


Fig. I.
Break Company's Seal and Remove Screw—THUS.

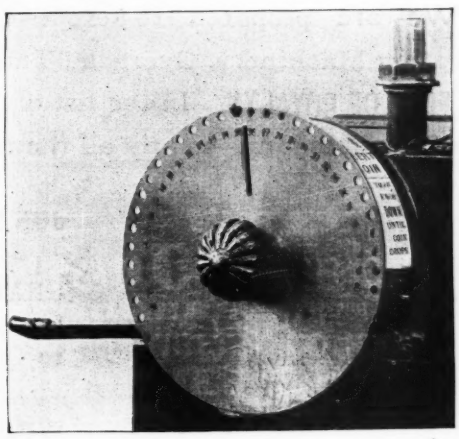


Fig. II.
Swing Band Back—THUS.

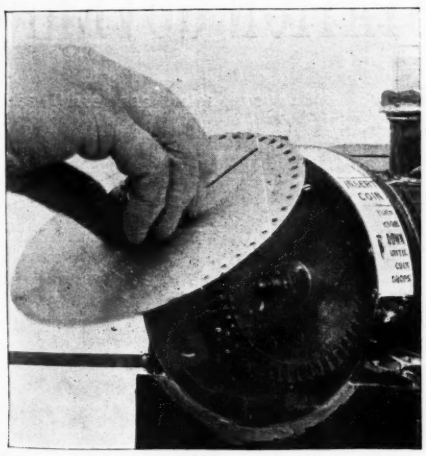


Fig. III.
Lift Plate Off—THUS.

Fig. IV.
Replace Plate—THUS.

Swing Band Forward—Replace Screw—and Re-seal.

NOTHING SO EASY. NOTHING SO ACCURATE.

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A "NEEDFUL" EXPLANATION.

We note an Advertisement in the "JOURNAL," under the name of the NEW CONVEYOR COMPANY, stating that they had taken over the business of the AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED; and, as it may create a false impression, we beg to say there are **NO VALID PATENTS** existing in connection with Inclined Retorts (beyond a few small and subsidiary ones, dealing with details).

We are prepared to erect Inclined Retort Plants, with Conveying and Elevating Machinery, Overhead Tanks, Hoppers, and Measuring Chambers, complete and **FREE OF ROYALTY.** In the list of places given, only a few were erected by the New Conveyor Company—nearly all the remainder being erected by the undersigned.

JONAS DRAKE & SON, OVENDEN, HALIFAX.

GRAHAM, MORTON, & CO., LIMITED, LEEDS.

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WINSTANLEY COMPANY, COVENTRY.

BRADDOCK'S New Patent GAS STATION GOVERNOR

GIVES A CONSTANT AND STEADY OUTLET PRESSURE UNDER ALL CONDITIONS.

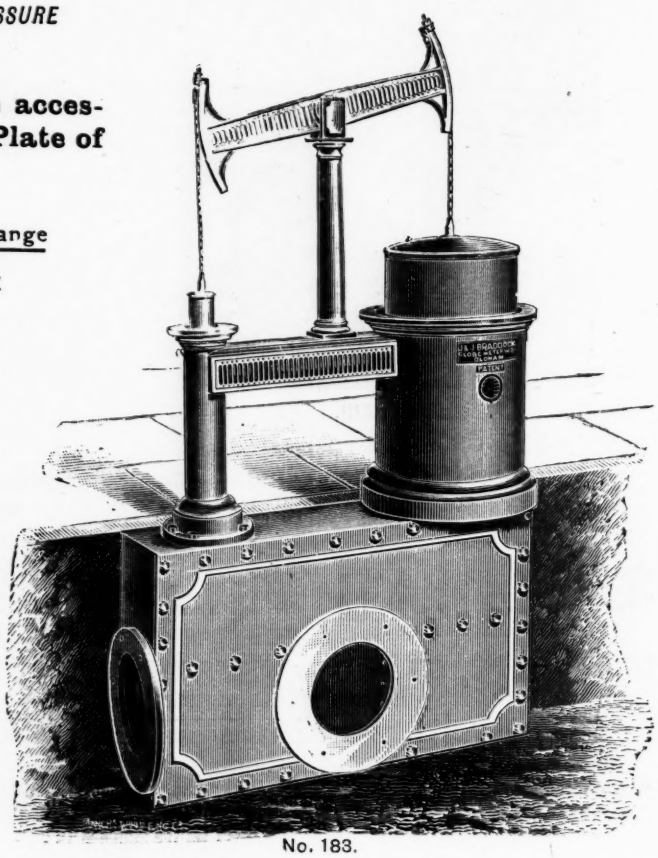
Valves and other internal parts are accessible upon the removal of the Side Plate of the Valve-Chamber.

Occupies very little Space. The Flange diameter is about the greatest width.

THE BEST IN THE MARKET.

The distance from the centre of Mains to the floor-level may be made to suit any requirements.

The Inlet and Outlet may be as Illustrated, or at opposite ends (or sides) of the Valve-Chamber.



No. 183.

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Globe Meter Works, OLDHAM,

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45 & 47, Westminster Bridge Road, London, S.E.

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been for the rise in the price of coals, they would have very soon reduced the price of gas. As to slot meters, the effect of the reduction would be 16 feet for a penny, instead of 17 feet.

Mr. Fisher asked the Referee, in the event of his deciding to sanction any increase, not to sanction the 3d. asked for, but something less, and not to allow the rise for twelve months, as in six months' time the Company might have a railway running into their works. Mr. Chapman remarked that Mr. Fisher was turning prophet. The Referee observed that he should go down to the works and see for himself; and he would send his decision as early as possible.

Dr. Haldane has made his award, in the course of which he says: "I am of opinion that the present cost to the Company per ton of coals delivered at their works justifies an advance beyond the sum of 4s. 3d. per 1000 cubic feet, the price of gas delivered by the Company within a radius of one mile from the King's Head Hotel, Harrow. I therefore authorize the advance in price from 4s. 3d. to 4s. 6d. per 1000 cubic feet of gas; this advance to commence at next quarter day from the present date, and to terminate at Midsummer quarter day, 1901."

COALOWNERS, GAS COMPANIES, AND THE COAL QUESTION.

The correspondence on the above subject in "The Times," to which reference has been made in the last two numbers of the "JOURNAL," was continued on the 14th inst. by "Another Coalowner," who wrote as follows in reply to Mr. Livesey, whose letter was given in our issue for that date (p. 425):—

Mr. Livesey is an acknowledged authority on questions connected with the making and supply of coal gas; but I gather from his letter of the 7th inst. that he is less intimately acquainted with colliery matters. Will you allow me to assure him that to work and continue to work a colliery at a loss is by no means an uncommon occurrence? In my own case, for five years past I have not made one penny profit, but, on the contrary, have annually lost from 1d. to 1s. 2d. per ton of coal raised. I feel sure that Mr. Livesey will readily understand that coalowners under such circumstances might reasonably feel a little sore when they see chairmen of gas companies gloating with well-satisfied complacency over the fact that, owing to the cheapness of coal, the shareholders receive their statutory dividend of 12½ per cent.

No doubt gas consumers and coal users will not be as well satisfied with coal at a reasonable price as when it was unreasonably cheap; but unsatisfied desires of this kind are not limited to coal. I own to them myself in relation to the iron and timber I use and to the labour I employ, the cost of which has increased and is increasing. My cost, not including any interest or capital charges, has increased 2s. 4d. per ton in the last five years, due to the advance in wages and prices of stores—the increase in selling price being 1s. 11d. in the same period.

I have no qualification for the *rôle* of prophet; but in relation to the probability of prices coming down there are some facts and circumstances which may be of interest to your readers. The fallacy of a comparison between 1873-4 and now is apparent to colliery owners. In 1873-4 there was a great reserve of unopened coal which could be got at at reasonable cost; and numbers of collieries were opened and many more were able to increase their output in a way which ere long far more than met the demand, which was vastly less than it is at present. Coalowners, as a rule, had little or no idea of acting together in relation to the sale of the produce of their pits; and foolish and unreasoning competition led to the cutting of prices and increased that deep depression in the industry which a wise and reasonable co-operation in relation to prices would have gone far to mitigate. The fact—for it is a fact—that increased output lessens cost obtained a too prominent position in the eyes of colliery engineers and managers, until the owners had the unpleasant experience forced upon them that what was saved in cost was more than lost in reduction of price.

As matters stand now, the circumstances are widely different. There is little or no coal in districts I am acquainted with which can be opened by fresh sinkings save at enormous cost. Collieries which in 1873-4 had ample coal within reasonable distance from the pits are now two and even three miles in; and others which were then working are now practically exhausted. I am quite aware that the national output has increased. But while in 1873-4 supply quickly overtook demand, it appears now that supply does not even keep pace with demand; and I venture to think that reduction in price will only be effected by a very materially lessened demand. As to the probabilities of the latter, I can only be guided by the facts before me. I find the great railway companies, if offered the option of a six or a twelve months' contract, generally choose the latter at equal prices. Shipowners contract for the usual long periods, and merchants and works are not only ready but eager to contract for a year at present prices. On the other hand, colliery owners are refusing to contract for greater quantities than in past years. An advance of 1s. 8d. per ton in house coal has just come into force; and the demand seems stronger than ever—not because merchants want to stock for the winter, since the practice of summer and winter prices has been long abandoned in this district. I am not acquainted with iron-works, but I am told that further advances in the price of iron are expected; and I think it will be found that the iron and steel industry is by no means the important factor in coal consumption it was some thirty years ago, having regard, of course, to the tonnage of coal raised.

Colliery owners have learnt a lesson from past misfortune. They have found, and are finding more and more, the necessity of acting together in matters relating to coal sales, not only in districts, but district with district. United action has been a plant of slow growth; but it has come to stay, and is a factor which has to be reckoned with.

Mr. B. Pickard replied to Mr. Livesey in "The Times" on Friday, as follows: I see from Mr. Livesey's remarks that he has been advising the general public not to buy coal, because the price of coal, as he assumes, will be lower directly. It is not for me to prophesy what the price of coal may be next winter. At the same time, I very much desire to prophesy of this fact—that coal, if not higher, will not be lower to the consuming public in London or in any other large city. I should like to ask Mr. Livesey a plain question or two. First, is it true that his Company have been buying up all the coal possible at the highest values recently, and the contracts will run until next June? Secondly, is it true all this was done with the full knowledge that, in his judgment, the prices would not recede before the end of June, 1901? If this be true, what is the commentary to be applied to the advice to the general public not to buy coal now, but to wait in the hope that values will recede immediately? All I can say is that, looking at the trade of the country and the present demand for coal both at home and abroad, he would be an unwise man to advise another man to refuse to buy coal if by that means he could save perhaps 1s. or 1s. 6d. a ton?"

Speaking at the annual meeting of Messrs. Henry Briggs, Son, and Co., Limited, last Wednesday, Mr. A. Currer Briggs gave expression to his views on the coal question. He said the reason coal had gone up in price was that other industries had been prosperous, and coal had been required in greater quantities. Another fact was that the supply was below the demand. He did not think the present price of coal would continue for very long after it had reached a point seriously endangering the national industries. Nor was it to be hoped that the high rates would last. It would be a great detriment to everyone in the country if the price of coal were to continue at such a figure as would threaten with extinction any other national industry. He had noticed remedies suggested for the present high price of coal—such as prohibiting exportation. It was an absurd misapprehension that exportation was the cause of the high rate. He mentioned that it had been stated that a gentleman had become alarmed because he had seen four or five cargoes of coal being discharged at Dunkirk, and had jumped to the conclusion that the French were storing up coal to use against this country. Coal had been sent to Dunkirk for thirty years. The Paris Gas Company formerly procured almost all their coal from this country; and if the gentleman in question had gone there two or three years ago, he would have seen English coal being discharged. He did not think the prohibition of the exportation of coal would take place. No Government would dare to do it. If they did, they would not only have to deal with the coalowners, but with the miners, 200,000 of whom would be thrown out of work by such a step. He could claim for Yorkshire coalowners that they had been singularly moderate as compared with coalowners in other parts of the country; and he would undertake to say that in this part of the world coal was cheaper than in any other portion of the kingdom. It was not unfair that they should take advantage of the times when they were able to increase the price, and when the demand almost forced them to do so. "The faster it goes up," concluded Mr. Briggs, "the faster it will go down, and less time will it remain at the extravagant figure."

THE REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACTS.

In the "JOURNAL" last week, we briefly noticed the issue of the report for the past year of the Chief Inspector under the Alkali, &c., Works Regulation Acts, 1881 and 1892 (Mr. R. Forbes Carpenter). We are now able to give some extracts from the report.

The number of works registered under the Acts in England, Ireland, and Wales is 1055. Of these, 88 only are works decomposing salt, and so scheduled as alkali works, while the remainder (967) carry on processes which are scheduled under the Acts of 1881 and 1892. These numbers show a net increase of two alkali and one other works since 1898. There are also 127 works registered in Scotland; bringing the total number of registered works to 1182. Concerning these, a separate report is presented to Her Majesty's Secretary for Scotland. The inspectors under the Acts paid 5011 visits to works, and carried out 5585 tests. There were four prosecutions for "failure to use the best practicable means for preventing escape of noxious gases, or for rendering them harmless and inoffensive when discharged;" and a penalty of £20 and costs was imposed in each case. One was in connection with the manufacture of tar, and another with that of sulphate of ammonia. Mr. Carpenter says that in the former case "very full warning was given; but protracted and deliberate neglect to re-erect and replace previously existing appliances could only be adequately met by the commencement of proceedings." The district inspector, we are told, "exercised much forbearance." In the latter case, the Chief Inspector acquits the proprietors of the works of intention to evade the requirements of the Act; but the warnings given as to the limited capacity of the plant were disregarded, and there was laxity in the management, as the plant was not stopped on the day the escape was discovered. The duty was a very painful one for Mr. Carpenter to have to carry out; and he expressed his pleasure in stating that the relations of confidence between the inspector and the firm have been in no way impaired. He says it cannot be too strongly urged that unless this feeling of mutual confidence exists and is cultivated, inspection becomes much less efficient in protecting the interests of the public.

Passing the sections of the report dealing with alkali and alkali waste and wet copper works, Mr. Carpenter comes to chlorine. No serious escapes of this gas reached him, nor did the district inspectors have much of their time occupied in dealing with them. He refers to the explosion at the Kurtz works of the United Alkali Company at St. Helens, on the 12th of May, which destroyed a large holder at the adjacent Corporation gas-works, as "the event that marks out the year 1899 as one which can never be forgotten in the Leblanc industry." At the time of his visit to the scene, he was informed of what was noticed concerning a barometer in the laboratory of the Hardshaw Brook Chemical Works; and he obtained, through Mr. E. G. Ballard, the Inspector for the district, the following particulars from the Chemist at the works:—

On May 12, 1899, at 10.20 a.m., a terrific explosion occurred at the Kurtz Chlorate of Potash Works. A barometer hanging in the laboratory at the Hardshaw Brook Chemical Works, about a quarter-of-a-mile from the scene of the explosion, suddenly rose, and immediately fell to a point indicated by some scum on the surface of the mercury being left behind in the barometer tube on the mercury rising again to its normal height. This point was at 22·6 inches from the surface of the mercury in the cup (corrected), indicating the vacuum created in the atmosphere after the explosion. The first effect of the explosion was a pressure which drove the mercury up above the normal height 2½ inches, until it was arrested by the closed end of the tube. It might have gone higher had the tube been

longer. It then fell to 22·6 inches, and left the mark on the barometer-tube mentioned. All the windows at the Hardshaw Brook Chemical Works were blown inwards; but at a greater distance from the scene of the explosion the windows were blown outwards. A closed room at a distance from the explosion would act as a cushion to any outward pressure; but the subsequent vacuum created outside caused the air in the rooms to expand and drive the windows outwards.

In the next sections of the report, Mr. Carpenter deals successively with sulphuric acid works (and, in this connection, devotes some space to new processes for the manufacture of sulphuric acid without vitriol chambers), chemical manure works, and works for the manufacture of sulphate and muriate of ammonia and the treatment of gas liquor. It is the last section which most concerns our readers. During the past year, many inquiries reached the Chief Inspector in regard to the method, referred to in previous reports, of combustion of the sulphuretted hydrogen to sulphurous acid, with subsequent neutralization of the latter by limestone in a tower fed with a flush of water on the top—the soluble product, bisulphite of calcium, subsequently flowing away to the drains; and he opens this part of his report by stating what precautions have been found necessary in working, and what conditions are absolutely essential for success. He then goes on to say that he thought it would be interesting to make a historical retrospect into the value of residuals in coal gas manufacture, going back to the year 1850 or thereabouts; and he cites as noteworthy the fact that there are still in active work members of the gas profession whose recollection goes back to that period. In many works it was undoubtedly the case that ammoniacal liquor was run into watercourses and drains, or where this could not be done, was evaporated in the ash-pans of retort fires. Rather more than fifty years ago, a return, to the order of Mr. Joseph Hume, on the gas undertakings of the United Kingdom was presented to the House of Commons, and was analyzed in early numbers of the "JOURNAL." Mr. Carpenter gives the following figures extracted therefrom:—

Raw Material.	Cost of Raw Material per Ton.	Value of Residuals. Per Cent. of Cost of Raw Material.
	s. d. s. d.	s. s.
Cannel—		
Scotch	12 5 to 24 4	5 to 20
Wigan	9 4½ ,, 15 6	20 ,, 25
Caking Coal—		
Cheshire	10 7 ,, 12 0	20 ,, 25
Cumberland	9 8 ,, 13 7	35 ,, 40
Staffordshire	8 4 ,, 20 0	35 ,, 40
Derbyshire	6 6 ,, 13 6	40 ,, 45
Somersetshire	10 0 ,, 13 0	40 ,, 45
Lancashire	— 8 11	45 ,, 50
South Wales	7 10 ,, 17 0	45 ,, 50
Yorkshire	5 4 ,, 12 4½	45 ,, 50
Newcastle	5 6 ,, 19 6	50 ,, 55

Mr. J. H. Cox, the Secretary and Manager of the Sunderland Gas Company, who, it may be remembered, celebrated last year the jubilee of his connection with the Company, supplied Mr. Carpenter with the following interesting information bearing upon this subject:—

—	1849.	1899.
Coals	3s. per ton	12s. per ton.
Coke	2s. 6d. per ton	10s. 6d. per ton.
Tar	2d. per gallon, sold to builders of wooden ships.	1¼d. per gallon, sold to tar distillers.
Ammoniacal liquor	3s. per 1000 gallons, sold to chemical works in the neighbourhood.	40s. per 1000 gallons, calculated from present price of sulphate.
Proportion of cost of coals received from residuals	65 per cent.	70 per cent.
Gas made	20 million cubic feet.	927 million cubic feet.

Referring to the foregoing particulars, Mr. Cox wrote as follows: "When 2d. per gallon for tar was paid in 1849, the production was small and the demand fairly good. When the production of tar increased, without any corresponding increase in the demand, prices came down until the discovery of benzene and aniline dyes,* when the demand was such that we received 2¾d. to 3d. per gallon. This was again followed by a depression in prices, and at one time it was difficult to obtain ½d. per gallon." The figures in the last line of Mr. Cox's table show at a glance the extent to which the Sunderland gas undertaking has grown during his connection with it.

The next portion of Mr. Carpenter's report is of such exceptional interest that we reproduce it practically as it stands:—

It seems desirable that I should give some attention here to the results of an examination made this year into the most recent of the processes for desulphurizing gas liquor developed at the works of the Halifax Corporation, and with which the name of Mr. Holgate, the Engineer of the works, is so closely associated. As little mention has been made of such processes in previous reports (my own remarks as District Inspector of No. 4 district in 1894,† on the Halifax process being almost the only reference that I can find) it will be also desirable to preface the results of this particular process with a short account of what has been previously done in this field.

When consulting, for an entirely different purpose—viz., the dealing with residuals from gas-works in the earlier part of the century—the "Historical Sketch of the Origin and Progress of Gas Lighting" by William Matthews (2nd Ed., 1832), kindly lent me by Mr. Warner, Engineer and Manager of the South Shields Gas Company, I came across a fact, known, I think, to but very few, that Mr. C. F. Claus was anticipated as early as 1817 in his process for gas purification in closed vessels by means of ammonia gas.* From p. 85, of this work I extract the following:—

One of the first of these plans, which is remarkable, was that devised by Mr. D. Wilson, of Dublin, who, in 1817, took out a patent for purifying coal gas by means of the chemical action of *ammoniacal gas*.† . . . As this combination of the sulphuretted hydrogen with the ammoniacal gas rendered the mixture soluble, it was dissolved in its passage through the water, and the carburetted hydrogen gas was rendered pure before it entered the gasometer to pass to the burners. Though this method proved efficacious for its purposes to a certain extent, it appears to have been attended with some inconveniences or difficulties, and was therefore never much introduced into practice.

Attention was directed subsequently to the desulphurization of gas liquor by various means, chiefly by heat; the compounds of ammonia with sulphuretted hydrogen and carbonic acid were split up, the latter going off in gaseous form, the ammonia being almost entirely retained in the liquor, which, when cooled, was fed on to the scrubbers and washers in place of fresh water, for removing the above-named impurities from a further portion of crude coal gas awaiting purification—the processes, of course, being continuous. While many labourers were in the field, the process in its ultimate form, in the year 1882, when such processes first came under the purview of the Alkali Act as "gas-liquor works—that is to say, any works in which gas liquor is used in any manufacturing process"—was known as the Hills process, though as co-workers in this connection the names of Mr. Richard Laming and Mr. George Livesey should not be forgotten.

Shortly after this, the processes with which the name of Mr. C. F. Claus is so intimately associated proceeded to development on a working scale. The recovery of sulphur from sulphuretted hydrogen, or from gases containing it, in proportions exceeding 15 per cent. by volume, has been a most valuable aid to various chemical industries. It at once proved an almost indispensable adjunct to the Hills process, as other means of satisfactorily dealing with the foul gases evolved had proved themselves by experience to be unsatisfactory. Mr. Claus's main process, however, was for the purification of crude coal gas by adding to the crude main a quantity of ammonia gas eight times the weight or volume of the ammonia carried naturally by that gas, and arising from the distillation of the coal in the retorts. Experimental plant was erected at the Birmingham Corporation Gas-Works at Windsor Street, which I myself saw in operation early in 1886. It had then been some time in use, and an additional tower had been erected to remove the organic sulphur compounds (often called bisulphide of carbon) from the crude gas usually removed as calcium sulphocarbonate by means of foul lime purifiers. In the Claus apparatus, ammonium polysulphide, prepared by dissolving sulphur in ammonium sulphide, was the re-agent employed for combining with, and removing, organic sulphur. It subsequently transpired that this was the re-invention of a process bearing the name of the late Dr. Leigh, Medical Officer of Health for Manchester, which was experimented upon at the works of the Gaslight and Coke Company, at Bromley, and mentioned by Dr. Ballard in his report to the Board on Effluvium Nuisances in 1878.

It was not, however, till January, 1889, that a plant designed to purify 2½ million cubic feet of gas per diem started operations at the works of the Belfast Corporation. The process worked intermittently till February, 1895, when it was finally abandoned, and has not since been revived elsewhere. Mr Stelfox, the Gas Engineer to the Belfast Corporation, contributed a most complete history of its working to the Gas Institute in 1897.‡ Of the paper it has been said: "We do not recall, in the whole range of technical literature, so candid a narrative." It is clear from this history that (1) the expectations of those interested were too sanguine, as regular and complete purification to the limits laid down for gas supply could not be effected, provision of dry lime purifiers being necessary as a final process; and (2) that the design and construction of the plant were not adapted to secure a successful solution of the problems facing the inventor or the engineer responsible. The importance of chemical engineering as a separate branch of applied science here received only too full an illustration.

Mr. Holgate's process started work in 1894, as already described; and at the Incorporated Institution of Gas Engineers in 1895 the record of a half-year's work was presented §—2 million cubic feet of gas being treated, on an average, per day. Since that time, additional scrubbers and washers have been erected; so that it is easily possible to get an 85 to 90 per cent. purification of the gas, and beyond 90 or 95 per cent. Mr. Holgate does not consider it would be wise to attempt to force the process. The remaining impurities can be removed more cheaply by dry purifiers. The conditions having changed through development in the course of the last four years, the figures I give of an examination of samples of unpurified and purified liquor in 1899 are not strictly comparable with those given by Mr. Holgate in 1895. I, however, present both results. [See opposite page.]

Attention should also be called to the improvements suggested first by Mr. W. Young, of Peebles, and patented by him in 1885, in the preparation of caustic ammonia, either in liquid or gaseous form, for the removal of impurities from coal gas. These are based on appreciation of the fact that at atmospheric pressure only a small range of temperature exists between the dissociation-point of carbonate and sulphide of ammonium and the boiling-point of water; and as the solvent power of water for ammonia at those temperatures at ordinary atmospheric pressure is small, the process of preparation of a crude caustic ammonia solution has to be conducted slowly in large vessels and with only weak gas liquors, else too great loss of gaseous ammonia ensues, unless an acid ammonia catch such as Mr. Holgate's is employed. If, however, the process is conducted while under considerable pressure (30 to 50 lbs. in excess of atmospheric), a greater quantity of caustic ammonia can be held in solution by the water, while the dissociation of the carbonate and sulphide of ammonium is not materially affected. Stronger crude gas liquor can, therefore, be safely employed.

These points are well worthy of further study and application by those interested in the development of such processes. The future of such processes must lie more within the domain of the engineer than of the chemist. What can be done chemically has been ascertained, but what will it cost to do? Will the capital cost, beyond a certain percentage purification, exceed that of the old method of dry purifiers of lime and oxide of iron, and at what point does that relation establish itself? If it does exceed it, will it still be possible by the economies in working, which are undoubted, to counterbalance this drawback? It appears to be established that the reaction in removal of impurities takes place more quickly, and in less space, when ammonia is used in the form of gas, in the proportions employed in the Claus process, than of liquor, but with the disadvantage of special plant

* Perkin's process being developed in 1856-7; Hofman's discovery of benzene in coal tar, and his pupil Mansfield's process for its extraction therefrom, preceding it in 1845 and 1847 respectively.

† *Vide* "Thirty-first Annual Report of the Chief Inspector under the Alkali, &c., Works Regulation Acts," p. 57.

* Reference was made to the fact in the notice of the life-work of Mr. Matthews which appeared in the "JOURNAL" on the 20th of February last (p. 465).—ED. J.G.L.

† "This patent is dated March 1, 1817, and the specification and drawings will be found in the 'Repertory of Arts,' Vol. XXXII., p. 11. Mr. J. F. Ledsam, of Birmingham, has recently obtained a patent for purifying coal gas by a similar process; and he states that his plan effects his purposes most completely, and is practised to a considerable extent at the Birmingham and Staffordshire Gas-Works."

‡ "JOURNAL," Vol. LXIX., pp. 1475-82. § *Ibid.*, Vol. LXV., pp. 1133-6.

Purified and Unpurified Gas Liquor, 1899.

Liquor.	Degrees Twaddel.	Chloride, calculated as HCl, per Cent.	Sulphur. As Thiosulphate. Sulphur Grammes per Cent.	Sulphur. As Sulphide. Sulphur Grammes per Cent.	Ammonia. Total, per cent.	Ammonia. Fixed, per Cent.	Ammonia. Free. Per Cent.	Ammonia. Free. A. H.E.	Carbonic Acid. Per Cent.	Carbonic Acid. B. H.E.	Sulphuretted Hydrogen. Per Cent.	Sulphuretted Hydrogen. C. H.E.	Total Acids (B + C); H.E.	Difference of Acids (B + C − A) H.E.	Difference of Acids (B + C − A, NH_3, H.E. = 100.)	Per Cent. of Total Acids as H_2S.
Gas . . .	5	0·654	·0691	·4016	1·9890	·6545	1·3345	78·50	1·348	61·25	·4267	25·10	86·35	+ 7·85	+10·00	29 06
Purified . .	2¾	0·650	·0435	·1971	1·7468	·6375	1·1093	65·25	·5214	23·70	·2094	12·32	36·02	−29 23	−44·79	34 20

Note.—Percentage of impurities removed by distillation 58·8, comparing with Mr. Holgate's final right-hand column. More liquor was passing through the heater of the desulphurizing plant when these samples were taken than on the occasion when Mr. Holgate took his samples for the analysis given in his table below.

From Mr. Holgate's Paper read before the Incorporated Institution of Gas Engineers, 1895.

Before Purification. Density. (° Twad.)	NH_3.	CO_2.	H_2S.	Total.	After Purification. Density. (° Twad.)	NH_3.	CO_2.	H_2S.	Total.	Impurities Removed, per Cent. Density. (° Twad.)	NH_3.	CO_2.	H_2S.	Total.
3·5 . .	1·343	..	..	1·760	1·50. .	0·986	..	..	0·528	2 00. .	26·5	..	..	70·0
4·0 . .	1·327	..	..	1·554	1·75. .	1·053	..	..	0·546	2·25. .	20·6	..	..	65·0
4·0 . .	1·360	2·18	0·50	2·680	2·00. .	1·130	0·99	0·08	1·070	2·00. .	16 9	54·5	84·0	60·0

and process being needed for its formation. Possibly a combination of the two processes might prove to present the greatest advantages. It is, however, certain that great advance in knowledge has been gained, by the experience of the last ten years, towards attaining the ideal of purification of gas in closed vessels, and placing it on a commercial and practical basis.

The subject is one that closely affects the work of the Inspectors. It is of not unfrequent occurrence for members of the staff to receive telegrams and urgent letters complaining bitterly of nuisance from the manufacture of sulphate of ammonia at gas-works, when, on inquiry, it turns out that the sulphate plant was idle on the day or days on which complaint was made, but that lime purifiers were being emptied. Over this nuisance, the Alkali Acts have no control; but it is not always easy to persuade sufferers from a nuisance that the Inspectors are not neglecting their duties.

Coming to the portion of the report dealing with the recovery and production of ammonia, the Chief Inspector is again able, through the courtesy of manufacturers, to continue the tables given for several years past on the produce of ammonia from all sources in the United Kingdom. These figures represent, in terms of sulphate of ammonia, the amount of ammonia and its salts produced in 1899; and they relate merely to production—not to what is marketable as sulphate:—

	1899. Tons.	1898. Tons.	1897. Tons.
Gas-works	136,529 ..	129,590 ..	132,724
Iron-works	17,963 ..	17,935 ..	17,779
Shale-works	38,780 ..	37,264 ..	37,153
Producer gas, coke, and carbonizing works . .	10,624 ..	11,568 ..	10,624
Total	198,280 ..	196,357 ..	198,280

Mr. Carpenter remarks that, in comparing the production in different departments during the last three years, an average figure seems to have been reached in one case (where, indeed, it was hoped for in 1899)—viz., in iron-works; that is to say, blast-furnace works where coal is used. In all other branches contributing to this important manufacture, it is gratifying to note substantial increases. He did not anticipate so great an increase in what is still the most important ammonia-producing industry—viz., gas-works. The drop in 1898 has been more than recovered; last year's produce showing a satisfactory increase over that of 1897. Mr. Carpenter points out that this indicates a very marked increase in the use of gas, when it is borne in mind how much the gas production of the country has been increasingly supplemented by admixture in various proportions of water gas made from coke and steam, in which operation no appreciable amount of ammonia is produced.

In leaving the consideration of this branch of his subject, the Chief Inspector directs attention to two notable circumstances affecting the water-gas industry—viz., the issue of the report of the Departmental Committee, which has been fully dealt with in our columns, and the publication of one on the Dellwik-Fleischer process by Professor Lunge,* confirming the earlier careful investigations of Professor Lewes and Dr. Bunte into the extraordinary fuel-efficiency of this process as compared with that of any other in which the product of the "blow" preliminary to the introduction of steam to the incandescent coke is carbonic oxide. Mr. Carpenter expresses his opinion of this process as follows: "It gives a method of obtaining, at very low cost, a concentrated gaseous fuel of fully twice the calorific power of producer gas, burning with a smokeless flame, and of very high flame temperature; so that problems of high-temperature chemistry, not otherwise approachable, become possible of trial. The industrial uses of such a gas stand quite apart from carburetted water-gas manufacture—a process that has been so perfected within the last fifteen years that, considered as a heat-engine, 81 per cent. of ultimate efficiency is attained; the energy of the blast gases issuing from the generator during the blow being utilized for subsequently gasifying the enriching oil in the presence of the heated water gas concurrently produced. Such a revolution must make its influence felt on the gas industry sooner or later, and in more ways than one." While recognizing that his report is not the place for dwelling upon any of the technical features or interesting chemical points arising out of the new process, the Chief Inspector considers that it is permissible, if there is such a future for it as is anticipated, to again direct attention, as he has done on previous occasions, to the need of precautionary measures and appliances being adopted to protect the workmen employed, in case of emergency.

Here, for the present, we must leave Mr. Carpenter's interesting report, which is twice the length of that in which he recorded the result of his labours in the year 1898.

* See "JOURNAL," Vol. LXXIV., pp. 819, 1191.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The half-yearly meeting of the Airedale Gas Company was held on Monday last week. The report of the Secretary (Mr. E. Thornton) showed that during the six months the receipts from the sale of gas had amounted to about the same sum as in the previous half year; but from the residual products above £200 more had been received than in the corresponding half of last year. The report also referred to the excessive increase in the cost of coal. The report was adopted; and the maximum dividends of 5 and 3½ per cent. were declared.

Presiding at the half-yearly meeting of the Aldershot Gas and Water Company, Mr. A. F. Wilson referred with gratification to the increase in the Company's business in the six months ending June 30, as compared with the corresponding period of the past year. The coal consumption had been considerably more; 8863 tons 14 cwt. having been consumed, against 7107 tons 12 cwt. The quantity of gas made had risen from 71,076,000 to 81,465,000 cubic feet; representing a rise of 14·61 per cent. This was a very large increase for any company to realize during the course of a half year; and it compared well with the most progressive of the London Gas Companies—the South Metropolitan—whose increase had been only 12 per cent. Referring to the coal question, he said they had spent £7492 in the past half year, and they would have to expend from £4000 to £6000 more for the same quantity in the current six months. As this required making up, they had had to raise the price of gas 3d. per 1000 cubic feet. The extension of the works necessitated an expenditure of money; and the Directors contemplated making another application to Parliament for further powers in the near future. As to the water supply, it was thoroughly satisfactory. The report of the Directors, noticed last week, was adopted.

The Directors of the Bridport Gas Company will report, at the meeting of shareholders to-day, that the sales of gas were higher by 1,098,200 cubic feet, or nearly 7 per cent., last year as compared with those for 1899. The revenue from gas amounted to £3144; from meter and stove hire, &c., to £135; and from residuals, to £976—the total receipts being £4305, against £3816. The expenditure on the manufacture of gas was £2458; on distribution, £201; and the other items on this side of the account made up a total of £3305, as compared with £2851. The amount carried to the profit and loss account is close upon £1000, against £965. The amount available for distribution was £1469, which enabled the Directors to recommend a dividend of 8 per cent. on the ordinary shares (free of income-tax), and 5 per cent. on the preference shares (less tax). This would absorb £982, and leave a balance of £487 to be carried forward. Reference is made to the necessity for an increase of 5d. per 1000 cubic feet in the price of gas, owing to the enhanced cost of coal, and to the completion of the new show-rooms and offices, noticed last week.

The half-yearly report of the Bristol Gas Company was noticed last week; and it was submitted to the shareholders last Thursday by Alderman J. W. S. Dix. In his remarks, he expressed the opinion that the account was a very gratifying one. He need not tell the shareholders that the Directors had not been free from anxiety and difficulty as to coal. The remarkable position of the coal market might be explainable to some, but it was inexplicable to others; but as it existed they had to consider it. He thought the Company would be able to surmount the difficulties in front of them; and he hoped to meet the shareholders under the same favourable circumstances at the next meeting. The sale of gas had increased by 10 per cent., which was satisfactory; and he saw no reason why it should not continue advancing in the future. If they went on as they were at present, he did not think they need have any fear as to the extinction of the Company. He had as great faith in the concern as he ever had, believing there was a great future before it. Their day increase was great, and this was also a very satisfactory feature.

There had been a considerable increase in the number of stoves for cooking purposes; and they had now 11,600 in use. The increase last year was 1700; 250 had been sent out during the past fortnight; and they had 365 on order to deliver. The report was adopted; and a dividend at the rate of 5 per cent. was declared. An extraordinary meeting was afterwards held; and resolutions of a formal nature were passed as to the further issue of stock. Mr. Weston Stevens proposed a vote of thanks to the Chairman, and mentioned that, notwithstanding the high price of coal, the Directors had not followed the example of other companies and raised the price of gas. The resolution having been carried, the Chairman said he could make no promise as to the future; but the Board would continue to do the best they could for the consumers.

At the recent half-yearly meeting of the Colchester Gas Company—Mr. Charles Coleman in the chair—the accounts to June 30 showed that there was a balance in hand on the revenue account of £2428; while on the profit and loss account there was one of £12,462. It was decided that a dividend at the rate of 10 per cent. on the old, and 7 per cent. on the new shares, free of income tax, should be declared.

The Eastbourne Gas Company report a profit for the half year of £7967, which, added to £11,647 (the balance brought forward after payment of the dividend in February last), and £89 received for interest, makes a total of £19,703 to the credit of the profit and loss account. The Directors recommend a dividend for the six months at the rate of 14½ per cent. per annum upon the £20,000 original capital and also upon £12,490 raised on the "C" shares, and at the rate of 11½ per cent. upon the £77,000 paid-up capital raised on "B" shares, which will absorb £6783, and leave £12,920 to be carried forward to the next account.

The annual report of the Faversham Gas Company, read at the annual meeting last Wednesday, furnished evidence of an improvement in the sale of residuals and gas; the latter showing an increase of £362, and the residuals a rise of £579. Against this had to be set the greater cost of manufacture. The net profit, after placing £300 to the suspense account for the renewal of the retort-house and retorts, and allowing for income-tax and interest, was £2493, which, with £1470 brought forward, made a total of £3963. Out of this, a dividend of 9 per cent. was recommended. The report further stated that during the year a site for a new gasholder had been acquired, and the holder and a good wharf were in course of construction. Water-gas plant was also in course of construction, and would shortly be available for use. The report and accounts were adopted. The Chairman (Mr. W. E. Rigden) referred to the deep regret felt by the Directors at the death of their late Manager, Mr. R. Darney, which was notified in our columns last week.

The balance-sheet of the Heckmondwike Gas Company for the past six months shows a profit of £1696, to which is added the balance from the previous half year; making £6209. After deducting interest on loans and dividends paid last March, a disposable balance of £4916 is left; and this will allow the full maximum dividends to be paid, and carry £3157 to the next half-year's account. The Directors report an increased consumption over last year of 6½ million feet, notwithstanding the adoption of electricity for lighting purposes at several of the local places of business.

In their report for the year ended June, the Directors of the Liverpool United Gaslight Company state that the total revenue was £594,171, and the expenditure £472,280; leaving a surplus of £121,891, which has been transferred to the credit of profit and loss. After deducting the amount taken for payment of the dividend declared last February, and the interest on the debenture stock, there remains a balance of £56,832, out of which the Directors recommend that a dividend for the half year ending June 30 last be declared of 5 per cent. on the ordinary consolidated "A" stock, and 3½ per cent. on the 7 per cent. "B" stock. The Directors record, with deep regret, the loss during the half year of the valuable services of their late colleague, Sir Thomas Earle, Bart., recently deceased. The vacancy thus caused at the Board has been filled by the appointment of Mr. Alfred Tyrer.

The annual meeting of the Maidstone Gas Company was held last Thursday, under the presidency of Mr. George Marsham. The report submitted showed a balance of £13,893; and a dividend of 11 per cent. per annum, less income-tax, for the year ended June 30, was recommended. In moving the adoption of the report, the Chairman alluded to the decision of the Board to erect another holder at a cost of £16,000, which would be met by the issue of new capital, chiefly debentures. The increase in the quantity of gas made during the year worked out at 7·8 per cent. Coal had cost them £19,908, against £16,296 for the preceding year; and it was expected that during the next twelve months the cost would be increased to somewhere about £33,000. The report was adopted.

The half-yearly meeting of the Malton Gas Company was held on the 8th inst. Mr. H. W. Pearson presided, and, in moving the adoption of the report and accounts, said the most marked feature of the past six months was the heavy increase in the price of coal, which had gone up fully 50 per cent. They had had, in consequence, to raise the price of gas. But while coal had gone up 50 per cent., they had not put up the price of gas more than 9 per cent. The report was adopted. Mr. Robert Metcalfe moved the payment of a dividend of 5½ per cent. for the half year, and pointed out that it was out of the actual earnings of the period covered by the report, while £1700 was also being carried forward. This was agreed to.

The report of the Directors of the Mirfield Gas Company states that the profit for the past six months amounted to £2617; and there is, with the balance from the previous half year, £4352 available for distribution. The Directors recommend the payment of a dividend of 10 per cent. on the old shares and 7 per cent. on the new shares; leaving £1852 to be carried forward.

At the half-yearly meeting of the Pontefract Gas Company last Friday, payment of the usual maximum dividends of 10 per cent. on the original shares and 7 per cent. on the new ordinary shares was resolved on. The Chairman (Mr. Joseph Taylor) stated that coal during the half year had cost £300 more than usual; and under the new contracts the increase would probably be £1100, which would be only partially recouped by the 3d. per 1000 feet added to the price of gas.

In the report which the Directors of the Reading Gas Company will present at the half-yearly general meeting to-day, they state that, owing to the continued increase in the business, it has become necessary to erect additional plant; and to provide for this they recommend the shareholders to authorize them to raise, as required, such part or the whole of the unused capital as may be necessary for the purpose. The yearly contracts for coal have been entered into at such an advanced price that the Directors have been reluctantly compelled to give notice that, from the date of recording the meter-indices for the Midsummer quarter, and until further notice, the price of gas will be increased to all consumers 2d. per 1000 cubic feet. Owing, however, to the enhanced value of residuals, and to their having acquired a large stock of coal at the old contract prices, they hope to be able during the current half year to meet the increase in the cost of manufacture by means of this small advance. The accounts accompanying the report show that the revenue from the sale of gas in the six months ending June 30 amounted to £26,093; of residual products, to £10,264; and the total receipts were £36,393. The outlay on the manufacture of gas was £24,730; on distribution, £2566; and on management, £1368—the total expenditure being £30,973. The balance carried to the revenue account was £5420; and the amount available for distribution, £19,578. The Directors recommend the declaration of the full dividends on all the stocks and shares.

At the meeting of the Scarborough Gas Company last Saturday, the Directors presented accounts which showed that the revenue in the six months ending June 30 amounted to £21,403, and the expenditure to £15,614; leaving a balance of £5789 to go to the profit and loss account. The net revenue, including £1665 brought forward, but after deducting all interest charges for the half year, was £6662. After providing for dividends on the preference stock, the Directors recommended the payment of maximum dividends upon the ordinary stock of the Company, less income-tax. The payment of these absorbed £6337; leaving a balance of £325. Inasmuch as the outlay on the carburetted water-gas installation has now ceased, the Directors have extinguished the suspense account by appropriating thereto £325, the balance from the profit and loss account, and £1799 from the reserve fund. Contracts for sulphate of ammonia and Claus sulphur-recovery plants have been concluded, and the work of construction and erection is in progress, under the supervision of the Engineer and Secretary (Mr. J. Holliday). The replacement of flat-flame burners by a system of incandescent lighting in certain thoroughfares in the borough indicated by the Corporation, was carried out during the past half year.

The accounts accompanying the report which will be presented at the half-yearly meeting of the Weymouth Gas Company next Thursday show that the revenue in the six months ending June 30 amounted to £8938, and the expenditure to £6584; leaving a balance of £2354 to go to the profit and loss account. The sum available for distribution is £4297; and the Directorsr ecommend the payment of a dividend for the half year at the rate of 5 per cent. per annum, less income-tax. In their two last reports, the Directors adverted to the fact that coal was then more costly; and they stated that it would become still more so. The accounts for the past half year confirm this statement, and show that the figure paid has been much higher than hitherto. For the next two half years, at least, the cost will be still further advanced; the Directors having entered into a new contract under which the price of the coal at the pit will be about doubled. The Company will, however, for a time benefit from an unexpired contract, so that the full force of the further increased cost will not be immediately felt. It has not yet been necessary to raise the price of gas; and the Directors assure the consumers that they will not take this step until the increased cost of production absolutely compels an advance. Apart from the coal question, the condition and prospects of the Company are good. Under the management of Mr. James Lowe, there has been a satisfactory expansion in the output of gas; the increased consumption during the half year being 6·9 per cent. on that of the corresponding period of the year 1899. The number of consumers is still increasing, and this season more than the usual quantity of cooking-stoves have been sent out.

It was reported to the shareholders of the Yeadon and Guiseley Gas Company last Wednesday that, during the past half year, the increase in business had been equal to 10½ per cent. There was also an increase of 101 in the number of slot meters, with an average increased consumption of 800 cubic feet per meter. The contracts for coal for the ensuing year meant an additional expense of £2250; and owing to this great increase (more than 5s. per ton), the price of gas had had to be raised from 2s. 8½d. to 3s. per 1000 cubic feet net. This, however, would not bring in more than half the sum named; and there must of necessity be a considerable deficit during the next two half years. The profits for the six months amounted to £1359, which would pay the maximum dividends of 10 and 7 per cent., and leave a balance of £87. The report was adopted.

Water Companies.

On Thursday, the 9th inst., Mr. J. Baird, the venerable Chairman of the Directors, presided over the half-yearly meeting of the Brompton, Chatham, Gillingham, &c., Water Company. The report showed that during the six months covered by it 397 houses and other supplies of water, estimated to yield an additional rental of £317, had been connected with the Company's mains. The capital expenditure now stands at £136,084, of which £10,123 was added during the above-named period. There was an increase of £482 in the water-rental as compared with the corresponding period of last year. The balance available, after charging the interest on the temporary loan from the bankers and placing £500 to the credit of the reserve fund, was £4416; and the Directors recommended payment of the maximum dividends at the rate of 10 per cent. per annum on the "A" shares and of 7 per cent. per annum on the new "B" shares. The report was adopted.

The Directors of the East Worcestershire Water Company report that during the past half year 92 additional services were laid on; making the total 5449 exclusive of Droitwich and Rednal. The average daily consumption of water was 653,047 gallons. The new works at Washingstocks are progressing. Since the last meeting, a *pro rata* allotment of shares, at a premium of £2 10s. per share, was offered to the shareholders; and of the 617 shares authorized 447 have been allotted, and the remainder will be dealt with as and when required. The premiums received—£1117 10s.—have been placed to the credit of a reserve fund apart from the fund reserved for the depreciation of plant. As to the half-year's accounts, the cost of coal has been again larger in proportion to the quantity of water pumped; and it has not been possible to place fresh contracts except at increased prices. The revenue account shows a profit of £1804, to which has to be added £1459 brought forward from the previous

account; making a disposable balance of £3263. It is proposed to pay a dividend at the rate of 4 per cent. per annum; to add to the depreciation reserve fund £1000; and to carry forward £989.

At the ordinary general meeting of the Frimley and Farnborough Water Company, the Directors reported a net balance of £1524; and they recommended a dividend for the past half year at the rate of 5 per cent. per annum. This was agreed to.

In the six months ending June 30, the revenue of the Woking Water and Gas Company amounted to £4496, and the expenditure to £2264; leaving a balance of £2232 to go to the profit and loss account. The amount available for distribution is £2226; and at the ordinary general meeting next Tuesday, the Directors will recommend the payment of a dividend at the rate of 4½ per cent. per annum for the past half year, less income-tax, which will absorb £1919, and leave £307 to be carried forward. The Directors report that the supply to the district has been satisfactorily maintained. Negotiations are practically completed for the acquisition of the site on the Thames for the new works authorized by the Company's Act of 1899; and their construction will be proceeded with at an early date. The Engineers (Messrs. J. Quick and Son) report that the works, plant, and mains are all in good order.

At the annual meeting of the Wrexham Water Company, the report presented stated that £6643 had been expended in carrying out various works for improving the supply. The receipts showed an increase of £621 as compared with the preceding year. After payment of the usual charges, the full dividends upon the preference shares and stock, and an interim dividend at 6½ per cent. per annum upon the consolidated stock, and £4 11s. per cent. per annum on the ordinary shares, there remained a balance of £5431. The Directors accordingly recommended the payment for the half year of the full preference dividends, and a dividend at the rate of 7 per cent. per annum on the consolidated stock, and £4 18s. per cent. on the ordinary shares, all free of income-tax. The report was adopted.

ELECTRIC LIGHTING NOTES.

The Lighting Committee of the Leeds Corporation have decided to recommend the Council to abolish the charge for electricity meters as from Oct. 1 next.

At Blackburn, last Friday, a Local Government Board inquiry was held into an application by the Corporation to borrow £190,000 for electricity extension purposes, including lighting and power. The present project will carry the Corporation on for four or five years, when they will still have land available at their proposed new works for an even more extensive scheme.

New machinery, which has been erected at a cost of £5000, at the Taunton Corporation electric lighting works, was formally set in motion last Wednesday. Many kind things were said on the occasion about the Chairman of the Committee (Alderman Potter), who has worked hard to secure the success of the concern. Both he and Mrs. Potter were presented with handsome gifts as an acknowledgment.

At the meeting of the Dublin Corporation yesterday week, the Lord Mayor moved the adoption of a report of the Electric Lighting Committee recommending application for a supplemental loan of £10,400, to cover the cost of additional works under the loan of £24,000 sanctioned by the Council and the Local Government Board for new electrical cables. The motion having being seconded, Mr. Beattie said he thought the matter should be considered more fully. The Lord Mayor significantly remarked that this was one of the cases in which the least said the soonest mended. The report was adopted.

The Yeadon District Council are still discussing the electric lighting question, and have had a conference with Mr. W. C. C. Hawtayne. At the close of the conference, the Council resolved to take a *plébiscite* of the householders in the compulsory area of supply, for the purpose of ascertaining the number of lights likely to be taken up at a charge of 5d. per unit; and after this to submit the whole of the facts to a ratepayers' meeting. The period of grace allowed by the Board of Trade before proceeding to consider the revocation of the Council's Provisional Order expires in about two months; so that there is not much time remaining in which the Council can take action.

There is trouble in the Sudbury (Suffolk) Town Council; and the electric lighting scheme is at the bottom of it. The mysterious manner in which this project is being hustled through has brought about what is apparently an irregularity. Alderman Bell, who has consistently battled for full and free discussion of the question by the ratepayers (and which has been refused) last Tuesday called the attention of his colleagues to the fact that the report on electric lighting which was adopted at a recent meeting of the Council was presented before it had been submitted to the General Purposes Committee by the Sub-Committee who prepared it; and this was not according to standing orders. The Town Clerk (Mr. W. B. Ransom) stated that he considered a resolution passed by a majority of the Council meant the suspension of the standing order. Mr. Ransom should be explicit, and say definitely whether it does or whether it does not. This method of procedure is not exactly the way they do things, say, in the House of Commons. But, of course, the Sudbury Town Council is not the House of Commons; and therefore anything may do for them—in Mr. Ransom's opinion. Alderman Bell should look into the matter, and, if there has been any irregularity, insist upon the report being dealt with in a proper way. He pointed out that there are several questions in the report that might advantageously have been discussed. He also stated that he considered the circular that had been sent round to the ratepayers a farce, and asserted that he knew a lot of respectable people who threw it on the fire. The replies did not in any way represent the voice of the town. After this, the Mayor (Mr. F. Wheeler) adopted a very injured tone; and regarded Alderman Bell's strictures as a reflection on himself, and actually offered to resign. Very gladly, when he saw an opportunity, he pointed out that there was no motion before the meeting, and turned to the next business.

The Finance Committee of the Leigh (Lancs.) Town Council have raised the salary of Mr. J. Foster, the Gas, Electricity, and Water Engineer, by £100 per annum.

PUBLIC HEALTH CONGRESS IN ABERDEEN.

The President's Address—Organic Matter in Water—The Treatment of Sewage—Suggested Imperial Board of Health.

The Annual Congress of the Royal Institute of Public Health was held in Aberdeen from the 2nd to the 7th inst., under the presidency of the Earl of Aberdeen. The delegates present included representatives from nearly all the municipalities in the kingdom. A goodly number of subjects were brought before them for consideration, but only a few were of special interest to our readers.

The President devoted his address to a review of the progress of sanitation as represented by legislation. Though the first enactments bearing upon this matter were passed at the end of the eighteenth century, it was not until 1846 that Parliament, doubtless as the result of the panic caused by outbreaks of cholera and other epidemics, considered it "highly expedient, for the purpose of preserving the health of divers of Her Majesty's subjects, that better provision should be made for the removal of certain nuisances likely to promote or increase disease." An Act was passed applying to the United Kingdom, and the central authority was the Privy Council, who were empowered to issue orders at any time to prevent the spreading of contagious or epidemic disease. Following this, which was the first Nuisances Removal Act, came the amending Acts of 1848 and 1849, by which the Central Board of Health in Great Britain and the Commissioners of Health in Ireland were enabled to issue directions and regulations, and to institute and carry on prosecutions for violation or neglect of regulations. This arrangement continued until the passing of the Nuisances Removal (Scotland) Act of 1856, when the above Acts were repealed so far as they related to Scotland, and the Board of Supervision, which had been constituted as a Poor Law Board in 1845, became the central authority instead of the General Board of Health. It was soon found that this Act could not be looked upon as final; and in 1867 a new and more comprehensive measure was introduced. This, the Public Health Act of 1867, re-enacted the provisions contained in the Act of 1856, with regard to nuisances, unwholesome food, common lodging-houses, and the sections relating to epidemic disease, but in addition contained sections adding considerably to the power of the Board of Supervision, and conferring more on local authorities with regard to offensive trades, hospitals, houses let in lodgings, vaccination, drainage, and water supply. The Public Health Act of 1867 was not long in force when it became evident that, in order to carry out sanitary improvements, an increased maximum rate of assessment was required. This and other amendments were subsequently made, and yet another step was taken by the passing of the Public Health (Amendment) Act of 1882, which introduced a further improvement into the sanitary system. These were the chief Public Health Acts proper down to the year 1897, when the existing Act was passed; but meanwhile the administrative machinery had undergone a great change by the passing of the Local Government (Scotland) Act, 1889. The next great step in public health legislation was the passing of the Local Government (Scotland) Act, 1894; its main feature, from a sanitary point of view, being the establishment of the Local Government Board for Scotland, in substitution for the Board of Supervision. The Acts already mentioned might be said to be the Sanitary Acts in the direct line; but there existed also a number of Acts relating to, or affecting, the public health, applicable to the United Kingdom, which might be called collateral Acts—*i.e.*, the Rivers Pollution Acts, the Factory and Workshop Acts, the Food and Drugs Acts, the Contagious Diseases (Animals) Acts, and the Housing of the Working Classes Acts. With the repeal of the old Public Health Acts and the passing of the new legislation, a link was severed which bound them to the old days of parochial sanitary administration, when the Parochial Board was the local authority for public health purposes, and the sanitary inspector the chief, and often the only, executive officer. The Local Government Act of 1889 changed the administrative machinery; but this was not the only Act which gave an impetus to sanitary progress. The infectious Diseases (Notification) Act, 1889, passed at the same time, was another step in the right direction; and although only a permissive Act, it was rapidly adopted by the rural local authorities—the small boroughs showing less eagerness in this movement towards sanitary reform. Reviewing the whole position, the President thought there was no justification for complacency, but rather reason for its exclusion. The contemplation of what had been accomplished, however, often in spite of prejudice and many obstacles, might assuredly give ground for encouragement and confidence as to future progress and attainment resulting from careful and persevering effort in dealing with the problems still confronting us.

In the course of the proceedings, Mr. T. Jamieson, the City Analyst of Aberdeen, read a paper on the "Effect of Organic Matter in Water on Health." He said that hitherto the danger of decomposed organic matter had not been sufficiently recognized; the result being that many waters which were reported as safe were probably dangerous, and, on the other hand, those which were condemned were probably quite safe. This was a serious statement, but it was based on the experience of a quarter-of-a-century, during which he had analyzed many hundred samples of waters over the North of Scotland. He had come to believe that in the presence of organic matter there was a capability of germs so to alter their character under their new environments as to give rise to a disease that would be identified with a specific germ. Eminent bacteriological authorities were quoted to show that, although such a feature was not yet generally accepted, it appeared to be dawning upon bacteriologists to take into account the fact that bacteria are simple vegetable organisms, and the wonderful adaptation in Nature enabling them to assume different forms under altered conditions, made this transformation both possible and probable. Having shown the fallacy of dividing these bacteria into parasitic and non-parasitic classes, he pointed out that we have to regard all bacteria as similar in character, but only gradational in power. It followed that their effectiveness on the animal body depended upon the relative degree of the resistance of that body. Instances were given of typhoid and diphtheria occurring under conditions that seemed altogether to preclude the conveyance of the specific germs; and this seemed to go far to support the suggestion that the gradational character of bacteria might go

so far under certain conditions as to be the cause of diseases that one usually considered to be absolutely limited to the action of a certain germ. The general conclusion was that putrefying organic matter taken into the system predisposed the human body, especially the weak and the young, to the action of non-specific microbes, and in such a way as to give rise eventually to a specific disease that would be accompanied by the presence of what was regarded as the specific microbe. Mr. Jamieson insisted that water should not be allowed to lie in a quiescent state in reservoirs, cisterns, dams, or filter-beds, which sooner or later became filthy, and, without the presence of any specific germ, gave rise to a low state of health in strong people, and actual illness in the young or weak. Finally, he instanced what took place in Aberdeen several years ago, when the water was found to be in a bad state. On following up the matter closely, it was ascertained that the contamination actually existed in the filter-beds which were supposed to be purifying the water. The golden rule, he said, was to take water from the running stream.

Professor Percy F. Frankland, of Mason College, Birmingham, delivered on the 6th inst. an instructive address on "Recent Developments in the Purification of Sewage." He commenced by explaining that there were three methods of dealing with sewage. There was, first, its disposal by discharge into rivers, estuaries, or the sea. This method was by far the easiest, but public opinion had led to a considerable diminution in this mode of disposal. The second consisted in the separation of more or less impurity by precipitation, mechanically or chemically. The third was by the destruction of impurity by resolving it into simple and inoffensive material. He described the methods employed at Birmingham, and went on to furnish a detailed account of his experiments in connection with the disposal of Manchester sewage. He proceeded to give details of the results produced experimentally in the case of filtration, from the days of the Rivers Pollution Commission, which dealt with the question in 1868, and those obtained since the discovery of the action of bacteria on sewage. The experiments at Manchester, he said, altogether exceeded their expectations as to the possibility of purifying the sewage from manufactories, particularly by the use of a system of multiple contact. He deplored the apathy of corporations who built libraries and undertook public works, but refused to consider the advisability of clearing away pollution because science could not make the sewage profitable. To expect science to show how money could at all times of the year be made out of town sewage was, in our climate, as unreasonable as to ask her to devise a means of lighting a town with electricity by utilizing the waste heat which escaped from the bodies of the inhabitants. All the great developments in the purification of sewage—chemical precipitation, irrigation, intermittent filtration, and the bacterial treatment, including septic solution—were essentially British, although we were deeply indebted to America for the extraordinary diligence with which some of its men of science had conducted a truly monumental series of experiments demonstrating the great possibilities of intermittent filtration. While, therefore, we might be justly proud of the great fertility of resource which had been exhibited in this country in dealing with the sewage problem, it was a matter for humiliation that there was in the whole British Empire no organization whose duty it was to carry out extended experimental inquiries on sanitary subjects on the scale, and with the thoroughness, adopted by the Massachusetts Board of Health. All scientific investigation in this country was carried on under extraordinary difficulties, and with little or no encouragement of any kind—frequently at private expense, and even on the private premises of the investigators, in hours or even odd moments snatched from a life of arduous duties of a routine character by means of which the daily bread was earned. His hearers all knew how much was gained in efficiency through combination, which was the watchword of the hour in the commercial world; and there could be no doubt that a similar increase in efficiency and in unexampled advance would result from combination in scientific inquiry. He considered that the Government ought to give to science in this country the position of influence and authority which it already occupies in almost every other civilized land, and that the objects of that section of science which the congress represented should be furthered by the creation of a great Imperial Board of Health, under the auspices of which scientific inquiries of the highest value should be systematically prosecuted in all directions.

In the course of a paper on the Public Health of Scotland, Mr. George Mackay, the Sanitary Inspector for the county of Perth, gave an elaborate account of the improvements which had taken place in the public health of Scotland during the 22 years ending 1898, as compared with the immediately preceding similar period. The practical application of the provisions of the long list of legislative enactments passed during these periods, and other operations incidental to sanitation, had involved the outlay of millions of money. It was difficult to specify the benefits conferred upon the community by this expenditure, but generally it might be said that the death-rates had been largely reduced, and such epidemics as formerly occurred were now unknown. Within the last fifty years, the average length of life had been raised to a figure between six and seven years for each person born; and there had been a gradual reduction in the death-rate all round. But the principal towns showed a greater improvement relatively than was seen throughout the country generally, with the exception of mainland rural districts, where there was an even greater improvement in the zymotic group. He came to the conclusion that the largest proportion of deaths in the country were not only preventable, but that much greater efforts ought to be made to ensure ultimate success. Although the country was much better equipped now, both in knowledge and appliances, to combat an epidemic, a great deal required to be done before it could be said that the death-rate was as low as it might be. In order that preventable diseases might be thoroughly combated, he suggested, among other things, that all populous places should have a properly organized public health service; that every sanitary inspector should have a certificate, and should have a proper salary; that plans of new buildings should be submitted for approval to the sanitary authorities; that all new buildings should be inspected, and their drainage tested, before they were occupied; that the supervision of public health in all burghs with a population under 10,000 should be vested in the hands of County Councils; and that a Minister of Public Health should be appointed who should have Cabinet rank.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 462.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.	£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p. c.	18⅞—19¼	..	5 7 8	60,000	5	Feb. 23	7	Ottoman, Ltd. . . .	5—5⅛	..	6 7 3
100,000	10	,,	7⅛	Do. 7 p. c.	13—14	..	5 7 2	500,000	100	June 1	6	People's Gas } 2nd Mtg. of Chicago } Bonds .	102—106	..	5 13 2
800,000	100	July 2	5	Australian 5 p. c. Deb. .	101—103	..	4 17 1								
200,000	5	May 16	6	Bombay, Ltd. . . .	6—6⅛	..	4 12 4	851,070	10	Apl. 27	7	River Plate Ord. . . .	10⅛—10⅜	+⅛	6 10 3
40,000	5	,,	6	Do. New, £4 paid .	4—4⅛	..	5 6 8	250,000	Stk.	June 28	4	Do. 4 p. c. Deb. .	100—102	..	3 18 5
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245—255*	+1	4 14 1	250,000	10	Apl. 11	8	San Paulo, Ltd. . . .	11⅛—12⅛	..	6 8 0
270,000	,,	,,	9	Do. New . . .	177—182*	—½	4 18 11	135,000	Stk.	Mar. 14	10	Sheffield A.	246—247	..	4 1 0
50,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145*	+2½	3 9 0	909,058	,,	,,	10	Do. B.	244—246	..	4 1 4
159,375	,,	June 14	4	Do. 4 p. c. Deb. .	116—120	..	3 6 8	447,427	,,	,,	10	Do. C.	244—246	..	4 1 4
220,000	Stk.	Mar. 14	11½	Brighton & Hove Orig. .	225—235	..	4 17 10	5,641,885	Stk.	Aug. 15	5⅛	South Metrop., 4 p.c. Ord.	125—128*	+1½	4 3 3
226,320	,,	,,	8⅛	Do. A. Ord. Stk. .	155—165	..	5 3 0	1,520,000	,,	July 12	3	Do. 3 p. c. Deb. . . .	94—97	..	3 1 10
1,009,500	Stk.	Feb. 23	5	Bristol, 5 p. c. max. .	125—130	..	3 16 11	380,940	Stk.	May 16	5	Southampton Ord. . . .	115—120	..	4 3 4
420,000	20	Mar. 29	10	British	39—41	..	4 17 7	70,825	,,	July 12	4	Do. 4 p.c. Deb.	117—122	..	3 5 7
50,000	10	Aug. 15	12	Bromley, Ord. 10 p. c. .	24—26*	+1	4 12 4	120,000	Stk.	Mar. 14	6	Tottenham } A. 5 p.c. and } B. 3½ p.c.	103—108	..	5 11 1
79,000	10	,,	9	Do. 7 p. c. . . .	19—21*	+1	4 5 8	250,520	,,	,,	4½		80—85	..	5 5 11
500,000	10	May 16	6	Buenos Ayres (New) Ltd.	8⅜—9⅛	..	6 9 9	55,100	,,	June 14	4	Edmonton } 4 p. c. Deb.	111—115	..	3 9 7
220,000	Stk.	June 14	4	Do. 4 p. c. Deb. .	98—100	−1	4 0 0	182,380	10	Jan. 12	5	Tuscan, Ltd.	7—8	..	6 5 0
150,000	20	July 12	8½	Cagliari, Ltd. . . .	23—25	..	6 12 0	149,900	10	July 2	5	Do. 5 p. c. Deb. Red.	98—102	..	4 18 0
100,000	10	June 14	8	Cape Town & Dis., Ltd.	13—14	..	5 14 4								
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	55—57	..	5 5 3								
550,000	Stk.	Apl. 11	13½	Commercial Old Stock .	270—280	..	4 16 5								
286,425	,,	,,	10½	Do. New do. .	205—215	..	4 17 8								
288,237	,,	June 14	4½	Do. 4½ p. c. Deb. .	133—138	..	3 5 3								
800,000	Stk.	May 31	9	Continental Union, Ltd.	158—163	..	5 10 5								
200,000	,,	,,	7	Do. 7 p. c. Pref. .	170—175	..	4 0 0	780,404	Stk.	June 28	11	WATER COMPANIES. Chelsea, Ord.	287—292	..	3 15 4
51,600	Stk.	Feb. 23	14	Croydon A 10 p. c. . .	335—340	..	4 2 4	150,000	,,	,,	5	Do. 5 p. c. Pref. .	155—160	..	3 2 6
178,400	,,	,,	11	Do. B 7 p. c. . . .	265—270	..	4 1 5	160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	143—148	..	3 0 10
555,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p. c.	107—112*	..	4 13 9	175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb. .	145—150	..	3 0 0
60,000	,,	,,	5	Do. 5 p. c. Pref. .	130—135*	+2½	3 14 1	1,720,560	Stk.	Apl. 11	7	East London, Ord. . .	185—190	..	3 13 8
486,090	10	July 27	11	European, Ltd. . . .	19—20	..	5 10 0	854,740	,,	June 14	4½	Do. 4½ p. c. Deb. .	147—152	..	2 19 3
854,060	10	,,	11	Do. £7 10s. paid .	14—15	..	5 10 0	890,000	,,	,,	8	Do. 8 p. c. Deb. .	96—98	..	3 1 3
14,993,075	Stk.	Aug. 15	4⅘	Gas- 4 p. c. Ord. . .	96—98*	+1¼	4 9 9	700,000	50	June 14	7½	Grand } 10 p. c. max. .	106—109	..	3 8 10
2,600,000	,,	,,	3⅘	light 3½ p. c. max. .	92—94*	−1	3 14 6	310,000	Stk.	Mar. 29	4	Junction } 4 p. c. Deb. .	130—135	..	2 19 3
3,799,785	,,	,,	4	and 4 p. c. Con. Pref.	114—117*	..	3 8 5	706,000	Stk.	Feb. 23	14	Kent	300—310	..	4 10 4
3,993,975	,,	June 14	3	Coke 3 p. c. Con. Deb.	92—95	..	3 8 2	160,000	,,	,,	7	Do. New, 7 p. c. max. .	200—210	..	3 6 8
70,000	10	May 31	8	Hongkong & China, Ltd.	13¼—14¼	..	5 10 4	1,043,800	100	June 28	10½	Lambeth, 10 p. c. max. .	275—285	..	3 11 8
2,800,000	Stk.	May 16	10	Imperial Continental .	199—204	+2	4 18 0	406,200	100	,,	8	Do. 7½ p. c. max. .	203—208	..	3 16 11
478,600	Stk.	Aug. 15	8⅓	Do. 8⅓ p. c. Deb. Red,	99—101*	+1	3 9 4	850,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb. .	128—132	..	3 0 7
75,000	5	June 14	6	Malta & Medn., Ltd. .	4½—5	..	6 0 0	500,000	100	Aug. 15	14	New River, New Shares	408—413*	..	3 7 10
560,000	100	Apl. 2	5	Met. of 5 p. c. Deb.	107—110	..	4 10 11	1,000,000	Stk.	July 27	4	Do. 4 p. c. Deb. .	128—133	..	3 0 2
250,000	100	,,	4½	Melbourne 4½ p. c. Deb.	106—108	..	4 3 4	902,300	Stk.	June 14	7⅛	South- wark } Ord. . . .	189—194	+2	3 17 4
541,920	20	May 31	3½	Monte Video, Ltd. . .	10½—11½	..	6 1 8	126,500	100	,,	7½		182—187	..	4 0 3
667,946	Stk.	Feb. 23	9½	Newc'tle & Gatesh'd Con.	215—220	..	4 4 1	489,300	Stk.	,,	5	and } 5 p. c. Pref.	155—160	..	3 2 6
299,855	Stk.	June 28	8⅓	Do. 8⅓ p. c. Deb. .	104—107	..	3 5 5	1,019,585	,,	Apl. 11	4	Vauxhall } 4 p. c. A Deb.	129—134	..	2 19 9
150,000	5	May 16	8	Oriental, Ltd. . . .	7⅛—7⅜	..	5 3 8	1,155,066	Stk.	June 14	10	West Middlesex . . .	270—275	..	3 12 9
135,000	5	,,	8	Do. New, £4 10s. pd.	6—6⅛	..	5 10 10	200,000	,,	,,	4½	Do. 4½ p. c. Deb. .	140—145	..	3 2 1
15,000	5	,,	8	Do. do. 1879, £1 pd.	1⅛—1⅜	..	4 11 5	200,000	,,	Mar. 14	8	Do. 8 p. c. Deb. .	98—100	−1	3 0 0
				* Ex. div.									*Ex div.		

CARDIFF CORPORATION WATER-WORKS.

Preparations for the Future.

An important report, prepared by Mr. C. H. Priestley, the Water-Works Engineer, has been submitted to the Cardiff Water-Works Committee with reference to the probable requirements of the town and district during the next ten years. The present population of the district is 220,000; and the quantity of water consumed, calculated at 25 gallons per head, was 5,500,000 gallons per day. Taking the prospective increase of population at 3 per cent. per annum, he estimated a population of 295,661 in 1910, and a consumption, at 30 gallons per head, of 8,809,830 gallons per day. The quantity of water available from the Taff Fawr source, with the reservoir there and at Llanishen, is about 7 to 7½ million gallons per day. With care and efficient inspection for waste, he considers the Taff Fawr works, together with the Llanishen storage, might be relied upon to provide sufficient water for the district for the next eight or nine years. In case of drought, however, it might be necessary to supplement the supply from local sources. He recommends the Committee not to delay commencing to construct the No. 3 reservoir, Taff Fawr, longer than 1902, or the spring time of 1903 at furthest; so that it may be ready for use in 1908 or 1909. With this new reservoir the total available supply from Taff Fawr sources would be 10½ million gallons per day. The Consulting Engineer, Mr. J. A. B. Williams, had in 1893 estimated the cost of constructing reservoir No. 3 at £217,179; but having regard to the rise in the prices of iron, coal, and materials generally, he (Mr. Priestley) thought the cost would now amount to 15 to 20 per cent. above this estimate. The report, which ran to great length, was ordered to be printed and copies circulated among the members.

GLASGOW CORPORATION WATER SUPPLY.

Description of the New Works.

Mr. J. M. Gale, M.Inst.C.E., Water Engineer to the Corporation of Glasgow, has prepared a statement regarding the operations during the past year upon the works for the augmentation of the water supply of the city, from which the following particulars are extracted:—

In addition to the four existing lines of 36-inch mains from the Mugdock reservoir to the city, two others of the same size are laid down from the Craigmaddie reservoir, which are intended to take up the supply to the higher levels of the city—one of which has been used since Dec. 14, 1895, to supply the higher ground at Springburn. The sum expended upon these works is £114,200. An extension of the two mains to the city was begun towards the latter end of 1896; the cost being about £27,000. The Craigmaddie reservoir has a water surface of 88 acres, and contains when full 717 million gallons; being a supply to the city at the rate of 50 million gallons per day for 14 days, in addition to the 10 days' supply, at the same rate, contained in the Mugdock reservoir. The inlet and outlet works have been so arranged that either or both of the reservoirs can be used to supply the six 36-inch mains. The works were completed, and the new reservoir begun to be filled on June 11, 1896; the opening ceremony being performed by the late Mr. Alexander Osborne, Chairman of the Water Committee. Water was drawn from this reservoir for supplying the city on Jan. 1, 1897, and has been continuously taken from it since then. The total sum expended up to now amounts to £300,000. The length of the new aqueduct from Loch Katrine will be about 23½ miles, of which 22¼ miles are completed and 1¼ miles under construction. It will be 1¾ miles shorter than the old one. It is 12 feet wide and 9 feet high where it is not lined with concrete; but only 10 feet wide where it is lined. The bottom is laid with concrete throughout the whole length, and it has a fall towards Glasgow of 1 in 5500. It consists of a succession of tunnels, which for the greater part were driven from the two ends without shafts; the drills being worked by compressed air, at a pressure of about 60lbs. per square inch. It will discharge 70 million gallons of water per day, which, added to the discharge of the old aqueduct of 40 millions, will bring up the total supply to the service reservoirs to 110 million gallons per day. Allowing for stoppages in the flow for examination and repairs, however, only 100 millions can be calculated upon as available for the city. The syphon pipes across the valleys of the Endrick and Blane will consist of four lines of 48-inch cast-iron pipes, two of which are at present laid.

Commencing at the south end of the aqueduct, the contracts lie in the following order: The Mugdock tunnel runs parallel with the old Mugdock tunnel at a distance of 22 yards between the centres. It is 1½ miles long, and is in great part through trap rock. The total cost has been £45,513. The Blane Valley contract extends from the north end of the Mugdock tunnel to the south side of the Endrick Valley, a distance of 5½ miles. The works include about ¾ of a mile of a double line of 48-inch pipes across the Blane Water, a tunnel 1½ and another 1¼ miles long, and junctions with the old aqueduct at both ends of the contract. The total cost has been £174,690. The Endrick Valley is 2½ miles wide, and the aqueduct crosses it by cast-iron pipes 48 inches in diameter, of which there will ultimately be four lines, but only two are laid at present. The works include a steel girder bridge over the River Endrick, another over the Forth and Clyde Railway, and a third over the public road to Aberfoyle. These contracts cost £63,500. The Black Rig contract extends from the north end of the Endrick piping to the south end of the Kelty contract at Lossnaugh, a distance of 3 miles 1 furlong. The chief feature of this contract is a tunnel, 2½ miles long, through some beds of soft red sandstone, which have given considerable trouble. The tunnel has been lined with concrete throughout its entire length. There are junction chambers at both ends, which connect with the old aqueduct. The total cost has been £97,762. The length of the Kelty and Duchray contracts is 6¼ miles, and the principal works consist of a tunnel 2½ miles long, another 1 mile 1 furlong long, another 1 mile long, and three short aqueduct bridges of masonry. The works connected with both contracts have been carried out at an approximate cost of £195,000. The Loch Chon contract extends from the north end of the Duchray contract, in the valley of Loch Ard, to the top of Loch Chon, a distance of 3½ miles.

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At the north end of the contract, a connection, similar to those already referred to, has been made with the old aqueduct. The contract has been carried out at a cost of £104,490. The contract for the Loch Katrine tunnel includes the driving of a tunnel through the ridge which separates Loch Chon from Loch Katrine, and of constructing an inlet basin at the loch similar to the inlet basin at the old tunnel, and the necessary alterations upon the old basin to adapt it to the future raising of the water-level of the loch. The tunnel is nearly 1 mile 3 furlongs in length, and was successfully driven through on June 14, 1898. The sum expended to date is £29,300.

The outlet works at the lower end of Loch Katrine include the building of a new masonry dam, by means of which the water in the loch will be raised 5 feet above its present top-water level, which will bring its storage capacity from 5623 to 9849 million gallons, which is estimated to yield to the city a supply of 65 million gallons per day. This contract was let in June, 1897, for £8185. By means of the new outlet works, the level of the water in the loch was raised 1 ft. 6 in. above its old top-water level in January last, and has been kept at this raised level whenever wet weather and consequent floods permitted. The additional 18 inches in depth of water will, it is hoped, be sufficient to meet the demands of a summer similar to that of last year (which was characterized by a long period of dry weather) when, towards the end of September, the level of the available water in the loch had been drawn down to the lowest since the Loch Katrine works were completed. The sum expended to date is £9500. A section of the works for which parliamentary authority has been obtained is the raising of Loch Arklet 25 feet and the forming of a tunnel to lead the water of that loch into Loch Katrine. These works will increase the supply to the city to 75 million gallons per day. When additional water is wanted, it must come from the adjoining valley of Loch Voil and Loch Doine.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

There were several incidents of interest before the Town Council of Glasgow on Thursday. First in point of order was a notice by Bailie Fife, of a motion—"That it be remitted to the Parliamentary Bills Committee to draft a Bill for next session of Parliament to give the Corporation power to purchase or lease lands containing coal or other minerals, or to purchase or lease existing coal mines, and to work the same in the interest of the city; further, to acquire for these purposes special borrowing powers to the amount of £500,000." Whatever may become of the motion—and I should be surprised if it were to result in anything being done—there is no doubt that the dear coal for the gas undertaking is at the bottom of the proposal. The motion will be discussed in September.

Mr. O'Hare gave notice of a motion to the effect that application should be made to Parliament for authority to establish a superannuation fund in connection with the Gas Department, to be applicable to, and compulsory upon, all permanent officials and workmen of the Department, with the exception of the General Manager and the Treasurer, and for powers to take over and appropriate for the purpose any monies handed to the Corporation by the old Gas Companies for benevolent purposes. This, I understand, is the beginning of the formal steps which are necessary for the establishment of the Friendly Society which the Gas Committee have resolved upon. There may be difference of opinion upon the details, when they are divulged; but they will first have to be discussed in Committee.

Mr. Wilson Buchanan asked the Sub-Convener of the Gas Committee under what statute the Corporation had power to charge an increased rate for gas for a period some three-and-a-half months prior to the passing, by the Corporation, of the Gas Committee's minutes recommending the increase. It was explained by the Lord Provost that the minutes of the Gas Committee had not been approved of. They would have been before the Council that day; but at the express desire of the Convener (ex-Bailie Mitchell), consideration of them had been delayed till the next meeting of the Council. The question was, however, quite a competent one. Mr. Buchanan put the question to the Clerk (Mr. J. Bowers), who replied that it had been the practice, during the 31 years since the Corporation took over the gas undertaking, that any increase or decrease in the price of gas was made retrospective to the beginning of the financial year. The gas accounts were closed at the 31st of May; and it was only after that date that the accounts were made up. It was, therefore, quite clear that the price of gas for the year could not be fixed until about the month of August. He thought the practice was founded upon necessity, and was quite within the statutory rights of the Corporation. Mr. Buchanan asked if the Corporation had statutory powers to make such a charge retrospective. The Lord Provost closed the incident with a violent rap with his gavel, and the testy remark that Mr. Buchanan had got his answer; and if he was not satisfied, he could give notice of motion. Upon this subject the Clerk was right, if there is no enactment regarding the fixing of the price. I know one instance in which the Act of Parliament distinctly says that the price of gas must be fixed for a period ensuing; and in that case, any change—at least, to a higher price—is never made retrospective. Where there is no express provision, expediency certainly dictates that the changes should be made applicable to the current financial year. The matter is, indeed, about as broad as it is long; because, if this increase were not made to date as from May, but from now, it would just have to be continued for three or four months longer than it will be necessary to continue it. If the rise be delayed, so will be the reduction; if it be accelerated, so will the reduction. It is a commonsense problem, and should be treated as such, which has been done here.

Not everyone is favoured on retiring from a post as Mr. A. Waddell has been in leaving Broughty Ferry for Dunfermline. The Burgh Commissioners on Monday night suspended the standing orders, and presented Mr. Waddell with a cheque for £50, to show their appreciation of his services. Mr. Christie, the Convener of the Works Committee, said that during Mr. Waddell's management the gas-works had been modernized; and they could now choose any one of three different

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methods of enrichment of their gas. Mr. Waddell had been the means of enabling them to reduce the price of gas, while all over the country it was found necessary to raise it. The resolution to make the presentation was agreed to unanimously, which is one of the best tributes to Mr. Waddell's abilities. Provost Gray, in making the presentation, said that Mr. Waddell had saved the community a large sum of money.

At the same meeting, the estimates for the current year were adopted. The income is calculated at £8530, and the expenditure at £8408; leaving a surplus of £122. Mr. Christie, in moving adoption of the estimates, said that coal was now costing them 5s. 6d. per ton more than last year. They had estimated for a consumption of 5 million cubic feet of gas more than last year. As explaining this, he might mention that, since their exhibition in May last, they had sold considerably over 100 gas cookers and heaters. They expected to realize a good deal more for coke. They had, in the meantime, stopped the oil system of enrichment, and no coke would be required for fuel; and they would also have more coke from the additional quantity of coal carbonized. They would have no difficulty in getting about 15s. per ton for coke, as compared with 9s. 6d. or 10s. last year. As matter of fact, they had some contracts fixed already at £1 per ton. It was not unreasonable therefore, he thought, to estimate for an increase of £804 upon that item. They expected that their expenditure upon coal would be £3600, as compared with £2756; but with the process of enrichment which they had adopted, they could use an inferior quality of coal with as satisfactory results. They spent £1032 last year upon gas oil; and they estimated that, with the new system, £417 would be all that would be required this year. Such a state of matters reflected great credit on their Manager, and on themselves for their enterprise and commercial spirit. The mere fact that four years ago they were paying £175 to the sinking fund, and were now paying £824 a year to the fund, showed that they were financing the undertaking on an absolutely safe basis. He moved that they reduce the price of gas by 5d., making it 2s. 6d. per 1000 cubic feet. This was unanimously agreed to. It is certainly a unique experience to have a reduction in the price of gas this year; and a reduction to the amount of 5d. almost makes the thought arise that it is too much. But the Commissioners went into the subject and were satisfied, so outsiders need have no compunction. How the new Manager, to be appointed, will look upon the matter, is scarcely in doubt. He has got a task set him which it will be difficult to work up to. Had Mr. Waddell remained, he would have been able to realize his own ideals; with another it may be different. One must make allowances in these matters. Doing that, it is sufficient to command one's admiration at Mr. Waddell's resourceful spirit to think that he can this year, upon a small output such as there is at Broughty Ferry, sell gas of 24-candle power at 2s. 6d. per 1000 cubic feet.

For the vacant post of Manager of the Broughty Ferry Corporation gas undertaking, there were twenty-three applications; and out of these, the Burgh Commissioners on Thursday selected the following as a short list: Mr. S. B. Langlands, of Coleraine; Mr. T. Lighbody, of Renfrew; Mr. W. Whyte, of Renton; Mr. J. W. Murray, of Glasgow; and Mr. F. Waddell, of Forfar.

The accounts of the Forfar Gas Corporation were before that body on Wednesday, with the report upon them by the Auditor, as given last week in my "Notes." Provost M'Dougall said that their accounts had been audited by a chartered accountant, and he thought they could congratulate themselves that, notwithstanding all that had been said about the gas accounts (and said by himself), they had come out very well indeed in connection with the audit. They knew that the Auditor had taken very great pains indeed in going to the bottom of all the accounts; and they ought to be very glad that he had certified them so heartily. There was a note or two regarding certain items; but they understood these items very well, and there was nothing worth remarking about them. These things would be put in proper order; and he thought that the accounts for the past year, and the estimates for the current year, were very satisfactory, and showed great economy and great credit to themselves as gas manufacturers, and to their Manager. Bailie Adamson said, with regard to the Auditor's note that they had exceeded their borrowing powers by £1200, that he, before the extensions were gone on with, called attention to the probability of their exceeding their borrowing powers; but the Clerk pointed out the great expense there would be in obtaining a Provisional Order giving them authority to borrow. He thought that the Clerk was entitled to their very best thanks for the way in which he had arranged the matter. The accounts were adopted, as were also the estimates for the current year, and the continuance of the price of gas at 3s. 9d. per 1000 cubic feet. Bailie Hanick, the Convener of the Gas Committee, in submitting these, said it was calculated that coal would cost them about £570 more this year. But they had a surplus of about £230; and they estimated that gas rates and residuals would show an increase. Owing to the improved conditions of working since the erection of the new gasholder, a large sum would be saved in furnishings and wages. The estimate was a safe one. Now is the triumph of Mr. Forbes Waddell, the Manager; now does his enlightened policy receive tardy vindication. The affairs of the Corporation were all along on a sound basis. The only thing which was out of gear was the Commissioners themselves. Mr. Waddell has succeeded in living down the altogether unmerited cold-shoulder treatment he has received; and if it be his fate to remain at Forfar, his course should now be of the smoothest. There is a point about the comment of the Auditor which is certainly worthy of notice. I suppose that everyone will admit that an independent audit of the accounts of public bodies is desirable. On the other hand, experience, I think, points to its being sometimes carried beyond the bounds of reason. A parish council gives a treat to the paupers under their charge, at the New Year, and the auditor, holding that this is not the purpose of the Poor Law Act, disallows the outlay, and the consequence is that it falls upon the individual members. This is harsh. In the case of Forfar, it is apparent that the Auditor, if he had had the power, would have compelled the Gas Corporation to have covered their borrowing by authority, no matter what the cost should have been. That, certainly, is the only safe policy. But, to go back to first principles, a municipality is only a combination of individuals for the common advantage; and if they see fit to undertake, for the common good, a little risk of loss, the affair is their own. In this case, £1200 may be written off in two years,

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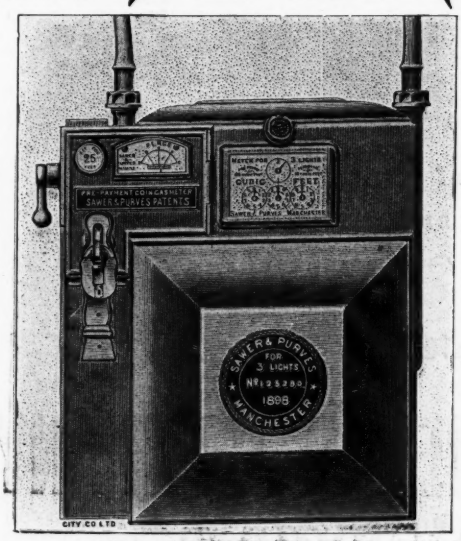

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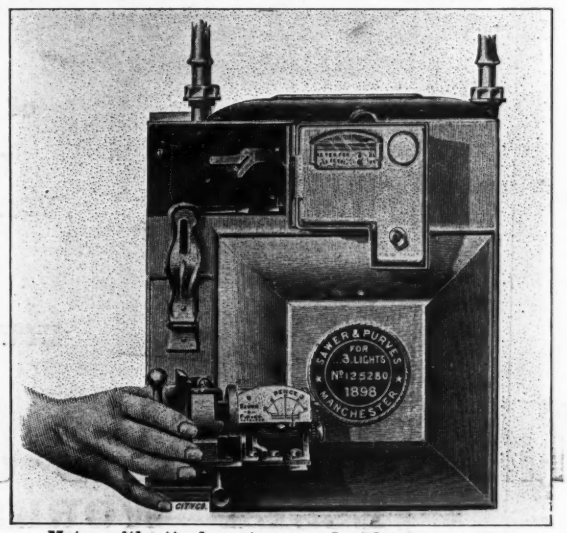

Meter with attachment removed without uncoupling.

and the undertaking will then be within statutory protection for all it has borrowed. It is only where there is opposition from within that the policy which has been pursued at Forfar could become questionable. On this occasion, there was, singularly, no opposition from within; and therefore the Corporation were undoubtedly right, although they did not adhere rigidly to form.

The members of the Greenock Gas Trust met privately last Tuesday, and talked over matters with more or less troubled faces; and, as the result of such inquiry as has been held, it has been ascertained, it is said, that this year the accounts are £2000 to the bad, and that a considerable increase in the price of gas will now be experienced by every consumer. The householders of Greenock, the great majority of whom are customers of the Gas Trust, would not grumble with any specified vehemence if the increase could be proved to be the result of the boom in coal, and nothing else. They would resign themselves to the inevitable. But what will be said if it be found that a proportion at least of the extra expenditure is the direct result of mismanagement? Is it really the case that some of last year's contracts for coal, bargained for at a much lower rate than is possible to-day, have not been implemented, and that, as a result, the Gas Trust has had to use coal at the dear instead of at the much more reasonable rate? Statements to this effect were made at the meeting on Tuesday, and the question is asked of the Convener of the Gas Committee (Mr. T. Mitchell) if he is in a position to show that they are untrue. It is urged that the whole question of gas management in Greenock must be brought to the light, and that a prolonged campaign of secrecy will not do. It may be possible to show that the management at Inchgreen has been shrewd and businesslike; but if it be found that the coalowners have been allowed to play "ducks and drakes" with the interests of the public, it may be anticipated that there will be much loud and bitter talk at the ensuing elections.

Mr. G. Keillor, jun., of Peterhead, has just been made the recipient of a most gratifying increase of £25 a year to his salary, as from the 15th of May last. The increase is, as expressed in the minutes of the Gas Committee, "in view of the additional work devolving on the Manager in the management and working of the new chemical plant, and in recognition of the success which had followed his operations during the past year." In speaking to the recommendation, Mr. Ritchie said they were all agreed that Mr. Keillor was deserving of the increase. He had been with them 18 months, and had been paid a low salary. They would have been pleased had he continued to work on the old lines; but by his ability and genius, he had saved them a large sum of money in the improvements he had effected. Mr. Keillor did not ask for the increase; it was a spontaneous offer on the part of the Committee, who thought it proper that such an increase should be given, in order that the temptation to leave Peterhead might be less. That is the true reason of the increase; and it is the best illustration of the estimation in which this enterprising young Manager is held by his Committee.

On the evening of Saturday last, it was discovered that a retaining wall about 40 feet high, between the gas-works at Milngavie and the River Allander, had given way and fallen into the river. A small gasholder, containing 14,000 cubic feet of gas, in consequence of the want of support, canted to one side, and the gas escaped. There is now only one gasholder on the works, the capacity of which is 20,000 cubic feet. The accident is attributed to the excessive rains of the week before.

The Johnstone Burgh Commissioners have retained the price of gas at 3s. 1½d. per 1000 cubic feet. They have been able to do this by reason of their having a surplus upon last year's working of £130, and a balance in hand, from previous years, of £1563, which they propose to utilize.

The Brechin Gaslight Company have paid a dividend at the rate of 25s. per share for the past year, which is 2s. 6d. per share less than for the year preceding. The price of gas has been advanced by 6d.; making it 5s. per 1000 cubic feet. During the past year, the consumption of gas showed an advance of about a million and a quarter cubic feet over the preceding year; this being largely owing to an increased demand for gas-cookers, and to an abnormal increase in the number of prepayment meters in use.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 18.

Sulphate of Ammonia.—There has again been a quiet market; and prices have barely been maintained—the closing quotations being £10 17s. 6d. to £10 18s. 9d. per ton, delivered f.o.b. at the ports. Direct orders have been scarce—consumers hanging on to the idea that prices must decline further. The bulk of the supply available has again been taken for covering purposes. Scotland has been the weakest factor; production there being sustained through the summer months, while elsewhere it is at its minimum. In the forward position, the divergent views of buyers and sellers have precluded much business. While makers look for a premium on spot prices of 5s. to 7s. 6d. per ton, according to position, consumers' views are scarcely above the level of prices for prompt delivery.

Nitrate of Soda is firm at 8s. 1½d. per cwt. for ordinary, and 8s. 4½d. for refined, quality on spot.

LONDON, *Aug.* 18.

Tar Products.—There is a fairly steady tone about tar products in general; but creosote continues sick, and extremely low prices are quoted from Scotland. Benzols are steady, and fair business passing; but there is not much doing in pitch, which is nominally about last week's price.

Prices may be taken as follows: Tar, 17s. to 26s. Pitch, east coast, 36s. 6d.; west coast, 32s. 6d. Benzol, 90's, 9d. to 9½d., according to position; special qualities for gas, 10½d.; 50's, 11d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Crude naphtha, 3½d. Heavy naphtha, 1s. 1d. Creosote, 2d. Heavy oils, 3d. Carbolic acid, 50's, 2s. 3d.; 60's, 2s. 9d. Naphthalene and salts, 50s. to 80s. Anthracene, "A," 4d.; "B," 3d.

Sulphate of Ammonia remains about last week's figures—viz., £10 15s. 3d. to £10 17s. 6d.

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COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—An exceeding pressure for all descriptions of round coal continues the most pronounced feature of the coal trade throughout this district. Household consumers, having evidently not yet recovered from the general fright as to higher prices, and notwithstanding the advance of 1s. 8d. per ton at the commencement of the month, are still ordering largely in excess of their present requirements; the obvious intention being to get in during the summer what stocks they possibly can to provide for winter necessities, and against any possible further upward move in prices. The result is that not only are collieries still unable to put anything into stock, but they are not raising sufficient quantities to meet the demand, and are mostly very much in arrear with their deliveries. It would not be surprising, supposing the pressure for extra supplies continues, if the advance in wages which commences in October should then be made the pretext for some further rise in prices. Indeed, this is being generally talked of; some colliery representatives expressing the opinion that best Wigan Arley may possibly touch 20s. per ton at the pit. Another feature in the market, which is also contributing towards checking any accumulation of stocks at collieries, is the special conditions in the gas coal contracts which were enforced this season. Under these conditions, the gas companies were bound to take 40 per cent. of their full contract quantities during the summer months; and it was pointed out by the manager of one of the largest gas companies recently, that they had now in stock three times the quantity of gas coal they usually held at this time of the year. The object of colliery proprietors is, of course, to compel the gas companies to stock the coal themselves, instead of its being put down in stock at the pits, and also to relieve them of the pressure during the winter, when there is a large inquiry for household purposes. Many of the gas companies have been objecting to take in these large stocks just now, as they are found very inconvenient to deal with; but the reply of the coalowners is that if they do not take the stocks now, they will not be supplied with more than 60 per cent. of the contract quantity during the winter months. For steam and forge coals, the inland demand continues exceedingly good; while for shipment there is also a large inquiry, which is in excess of the supplies collieries are just now able to send to the ports. The general result is that prices for all descriptions of round coal are exceedingly strong, on the basis of full list rates. These average 16s. 6d. to 17s. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, 14s. to 14s. 6d. for common house coal, and 12s. 6d. to 13s. for steam and forge coal, with ordinary steam coal 15s. 3d. delivered at the Mersey ports. Supplies of slack, as might naturally be expected, continue plentiful on the market, owing to the exceptional quantity of round coal now being screened; but, notwithstanding, surplus lots are being sent in freely from other districts at much below local quotations, Lancashire collieries are determined to hold on to their full list basis, and at a recent meeting it was decided that it was inexpedient to make any concession, as the general opinion was that the present surplus of slack on the market would only be temporary. Best slack is still quoted at 11s. to 11s. 6d. per ton, and common sorts at 10s. 6d. at the Lancashire collieries. The position with regard to coke is not quite so strong. During the past week or two, there has been some underselling by merchants who have been able to place quantities they had previously bought; and now lower quotations are also coming upon the market from some of the coke makers. This, however, is chiefly in the lower qualities suitable for furnace purposes. Quotations remain without any very material change, and range from about 23s. 6d. to 24s. for furnace coke, and 31s. to 32s. for foundry qualities at the ovens.

Northern Coal Trade.—There is considerable activity in the coal trade, and the range of prices is rather higher. But the production at the collieries is full; and there is rather a lack of ready steamers to take cargo, so that there is no rush in the demand. In the Northumbrian coal trade, the demand is steady; and best Northumbrian steam coals are quoted at 19s. to 19s. 6d. per ton f.o.b., though very little is sold at figures like these—most of it being on contract at lower prices. Second-class steam coals are quoted at 18s. 6d. per ton; and steam smalls average about 12s. In gas coal, there is a steady and increasing demand, both for shipment and for local consumption; so that the output at the collieries is well taken up. The price of gas coal for occasional cargoes is put as about 17s. per ton f.o.b.; but for forward delivery, it is believed that much lower prices are being taken. Shipments of gas coals to the Thames are now growing heavier; and the fine weather has allowed good passages to be made. Coke is very firm, both for export and for home consumption, the price being 34s. to 35s. per ton f.o.b. for export qualities, and about 29s. per ton at the blast furnaces for good furnace kinds. There is little or no alteration in gas coke this week, though the margin for export should soon increase. Prices are unaltered.

Scotch Coal Trade.—There is a firmer tone in the coal market as the holidays of the workmen expire. The demand is greater, and prices are rising, for all sorts, with the likelihood that they will go up further. The quotations are: Main 14s. 6d. to 14s. 9d. per ton f.o.b. Glasgow, ell 16s. 3d. to 17s. 3d., and splint 16s. to 16s. 6d. The shipments for the week were 228,149 tons—a decrease of 1065 tons upon the previous week, but an increase of 42,594 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,417,746 tons—an increase of 1,132,284 tons upon the corresponding period of last year.

Alcester Water-Works and the District Council.—The Directors of the Alcester Water Company being agreeable to the consideration of the question of the transfer of their works to the District Council, the latter body have appointed a Committee to meet the Board to discuss terms and conditions.

A Water Scheme for Dursley.—The Local Government Board have sanctioned the borrowing, by the Local Authority of Dursley, of £4650 for carrying out a water supply scheme. Repayment is spread over a period of 30 years, at 3¼ per cent. interest. The work will be proceeded with at once.

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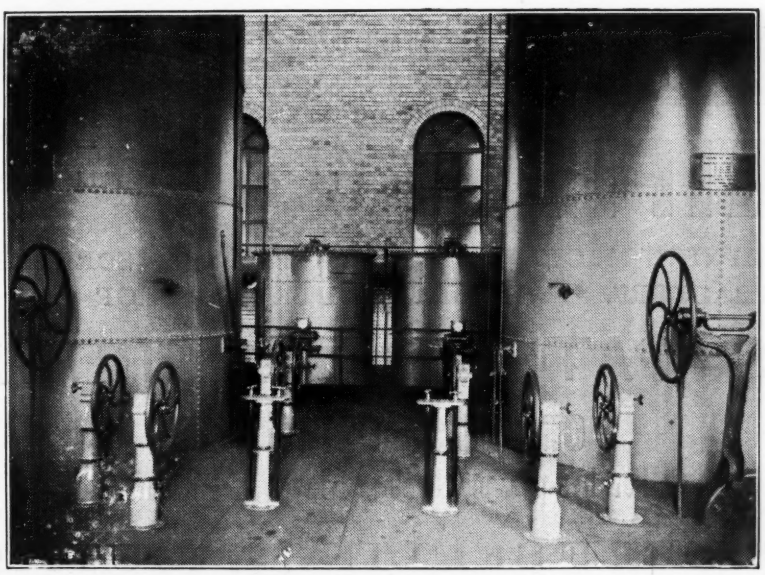

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Water-Main Extensions at Harrogate.—The Harrogate Town Council yesterday week agreed to make application for sanction to borrow £5000, to meet the cost of probable extensions of water-mains during the ensuing twelve months. There was an application from Scriven to supply them—which the Council are compelled to do—and which will cost about £2570.

Barnet District Gas and Water Company.—In the report which the Directors of this Company will present at the half-yearly general meeting next Friday, they state that the balance on the profit and loss account amounts to £16,460, out of which they will recommend the declaration of a dividend, less income-tax, for the six months ending June 30, at the rate of 9 per cent. per annum on the "A" and "C" stocks, of 8 per cent. per annum on the "B" stock; and of £6 6s. per cent. per annum on the "D" capital gas and water stocks. The business of the Company continues to progress.

The Loan for the Purchase of the Gainsborough Gas-Works.—At a meeting of Gainsborough District Council last week, the question of the loan for purchasing the gas undertaking was considered. It was decided to accept £50,000 from the Clerical, Medical, and General Life Assurance Company at 3½ per cent. interest, repayable over a period of thirty years. The offer of Mr. Woodall, of Scarborough, of £15,000 at 3½ per cent., was also accepted. It was stated that the Clerk had had great difficulty in placing this loan, which was as yet incomplete, but they were negotiating for the balance.

Suicide by Gas.—Last Tuesday, at Manchester, an inquest was held with reference to the death of Thomas Martin (age 24), a tinplate worker, who lived at his parents' house in Edensor Street, Beswick. He was found dead in bed on Sunday morning. The burner had been taken off the gas-bracket in the room, which was full of gas through the escape, and death had evidently been caused by inhalation of the gas. It was stated that the man two months ago removed the burner; but the fact was discovered before there was any serious result. He had been heard to say that he wished he was out of the world; and then he would not have to work. A verdict of "Suicide while insane" was returned.

Benefiting One Corporation Department at the Expense of Another.—The notable discovery has been made by the Bradford Corporation Water-Works Committee, that their great undertaking can at last be made to show a balance on the right side by the simple device of charging other Corporation departments for the water used by them. "This," says the "Bradford Observer," "may remind gas consumers of a still more important cross-charge by one department against another, which does not appear in the annual accounts. Gas consumers pay for the lighting of the streets, even before they begin further to contribute some profit in relief of the rates. They do not feel the burden; and perhaps the streets are better lighted than they would be if the actual cost appeared clearly in the estimates. But these unstated and invisible expenditures by one Corporation department at the expense of another seem hardly just to either party. Perhaps the Gas Committee may follow the Water Committee's example, if coal—but let us not mention it."

The New Reservoir for the Tees Valley Water Board.—A protest has been forwarded from a public meeting of Middlesbrough ratepayers to the Tees Valley Water Board against the decision of the Board in letting the contract for £385,000 for the work in connection with the Grassholm reservoir without obtaining tenders by open competition. At the meeting of the Board on Monday last week, the General Manager (Mr. D. D. Wilson) was instructed to draw up a suitable reply.

Meter Testing in Birmingham.—At a meeting of the Magistrates of Birmingham last Tuesday, the Chairman of the Gas-Meter Testing Committee (Mr. Maurice Pollack) submitted the annual report. It stated that the net profit of the department for the past year was £277, as against £290 for the previous year; the total receipts having been £760. During the year, 22,566 meters were tested, as against 3146 in the previous year; 232 being rejected as incorrect within the meaning of the Sales of Gas Act.

The Severn Commissioners and the Value of Compensation Water.—At the annual meeting of the Severn Commissioners on Monday last week, a report was submitted by the Engineer (Mr. E. D. Marten) in regard to some careful investigations that he has been making into the question of the extent to which the impounding and the abstraction of the waters of the River Vyrnwy for the supply of Liverpool, affect the Severn, of which the Vyrnwy is one of the principal tributaries. He said he found that the contention of promoters of such schemes, that while they abstracted flood waters which were detrimental to riparian owners' interests, they increased the volume of the stream in dry times by means of the compensation waters, making their operations beneficial to all parties, was altogether delusive—at least so far as the Severn was concerned. From the reports as to the daily height of the Lake Vyrnwy for the past ten years, it was shown conclusively that no flood waters of detrimental magnitude had ever been caught by Lake Vyrnwy, since it always happened that in the case of a bank full flood at Worcester, Lake Vyrnwy had been full and overflowing for many days previously; thus affording no storage whatever. He was of opinion that it actually accelerates the discharge of floods, as the waters coming down from the surrounding hills were discharged on to the smooth surface of the lake, instead of into the tortuous ditches of a flat valley, as was formerly the case. While flood water escaped, useful freshets which would otherwise pass down the river were caught and lost to the river altogether at times when they were badly wanted. The amount of daily compensation water was 10 million gallons, with an addition of 40 million gallons a day on four consecutive days in eight months from March to October inclusive. Whereas this amount of water was supposed to reduce the height of the lake 9 or 10 inches, there were times when the quantity of water in the lake had risen during the discharge, showing that larger quantities of water were entering the lake, and would have passed down the river, than was given in compensation. He recommended that, when any future proposal was made to abstract water from the Severn watershed, provision should be made that the compensation water should be discharged at such periods as may be most in accordance with the requirements of the river rather than at fixed dates as now. The report was adopted.

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GASHOLDERS WITH OR WITHOUT STEEL STANDARDS AND TANKS.

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PURIFYING-MACHINES FOR AMMONIA. SCRUBBERS.
TAR-EXTRACTORS. RETORT MOUTHPIECES OF ANY SHAPE.

WECK'S PATENT CENTRE-VALVES.

CONDENSERS. **CRIPPS'S GRID-VALVE** TAR-BURNERS.
SIEVES. For bye-passing the lower layer in Purifiers. VALVES.

TYSOE'S SELF-SEALING MOUTHPIECES.

Tar-Distilling Plants. Claus' Sulphur-Recovery Plants.

SULPHATE OF AMMONIA PLANTS.

The Popularity of Slot Meters in London is shown by the last report of the Chief Officer of the Public Control Department of the London County Council (Mr. Alfred Spencer). It is stated therein that the number of gas-meters tested by the department was 211,392; the fees received in respect of them being £6724. Nearly half the total number of meters tested during the past year were of the slot type.

Paris Exhibition Awards.—The following are among the awards made in connection with the British Section of the Paris Exhibition: Grand Prizes.—Metropolitan Gas Referees (for the pentane table photometer); Messrs. Crossley Bros., Limited. Gold Medals.—Campbell Gas-Engine Company, Kitson Lighting and Heating Syndicate, National Gas-Engine Company, and Tangyes Limited. The last-named firm have also been awarded a bronze medal for their collective exhibit of engines, pumps, &c., in Class 19.

Improvements at the Smethwick Corporation Gas-Works.—At a meeting of the Smethwick Town Council on Tuesday, the Town Clerk was instructed to apply for a Provisional Order to sanction the borrowing of £50,000 to defray the cost of extending and improving the gas-works. A sum of £13,000 is to be raised under the existing Order, which will exhaust the Corporation's borrowing powers. The first-named amount will be required for providing siding accommodation and the erection of a bridge and other improvements.

Suffocated at a Gas-Works.—Thomas Bristowe, of Barking, a labourer employed at the Beckton Gas-Works, was found on Monday last week by a fellow-workman lying on the floor of the acid chamber, which was full of gas. At the inquest, the Jury returned a verdict that death was due to suffocation by gas caused by a defective valve; adding a rider to the effect that the valves should have been examined before being used, and that two men should have been employed on so dangerous an occupation as that in which deceased was engaged.

Leigh (Lancs.) Gas and Water Supply.—The Leigh Town Council are making extensive enlargements and improvements at their gas-works, at a total cost of upwards of £50,000. The street-lamps are in future to be fitted with incandescent burners. The Leigh and Hindley Joint Water Board have applied to the Local Government Board to have the joint authority dissolved. The Leigh Town Council propose shortly to have a large main constructed from the reservoirs at Westhoughton to the town, the water supply at present being so inadequate both as to quantity and pressure.

The Letterkenny Gas-Works Transfer.—The transfer has just been effected of the undertaking of the Letterkenny Gas Company to the Urban District Council. The Arbitrators were: For the Gas Company, Mr. T. Reilly, of Strabane; and for the Council, Mr. R. J. Skinner, of Londonderry. These gentlemen being unable to agree as to the price, the services of Mr. S. B. Langlands, of Coleraine, as Referee, were requisitioned; and he gave an award which, we understand, has proved satisfactory to both parties. Mr. Langlands was for twelve years an assistant to Mr. James M'Gilchrist at the Dumbarton Corporation Gas-Works, and he there acquired a wide experience in valuation work.

New Water-Works for Matlock.—The Matlock District Council have power to spend £5000 on additional works of water supply. They have accepted a tender for an experimental artesian boring amounting to £740.

Another Burst in the Vyrnwy Main.—A serious burst of the Liverpool water-main from Vyrnwy occurred at Colebrook, seven miles from Northwich, last Saturday week. The main burst in a field; a pipe 5 ft. by 18 in. being shattered. The water rushed like a torrent, tearing up 25 yards of land to a depth of 7 feet. The surface of the Tarporley main road was washed away, and the gauge-house of the Northwich Water-Works flooded. The village looked like a sea beach; and before the outpour could be arrested, many thousand gallons of water were lost. This is the third burst in Colebrook in twelve months.

The South-West Cumberland Water Scheme.—A special meeting of the Whitehaven Rural District Council was recently held to consider the terms offered by the Whitehaven Town Council for the supply of water to the southern district of West Cumberland. Mr. G. W. Kenworthy presided. The Clerk read a letter from the Town Clerk (Mr. T. Brown) stating that his Council had agreed to supply the district up to 300,000 gallons per day at 3d. per 1000 gallons, with a rebate of ¼d. per 1000 on the quantity in excess of 200,000 gallons. It was decided that the terms be accepted, subject to the approval of the Local Government Board.

New Joint-Stock Companies.—The Gas Self-Lighting Company, Limited, has been registered with a capital of £45,000, in £1 shares, to produce and supply light, to carry on the business of a gas company generally, and to manufacture and deal in coke, tar, pitch, &c. The British Pure Acetylene Gas Company, Limited, has been registered with a capital of £5000, in £1 shares, to carry on the business of manufacturers of, and dealers in, acetylene gas and other inflammable gas or artificial light, gas, water, and general engineers, &c. Rigg's Coal Tippler, Limited, with a capital of £10,000, in £1 shares, is to acquire a certain invention of James Rigg, for improvements in power-driven oscillating tipplers, for loading coal, and to carry on business as manufacturing engineers, &c.

Mansfield Corporation Gas Supply.—At a recent meeting of the Mansfield Town Council, the report of the Gas Committee for the year ended the 31st of March showed a loss on the year's working of £200, which, having regard to the facts, could not be considered unsatisfactory. The price of coal had averaged 1s. 6d. per ton more than in the preceding twelve months; but no corresponding increase was made in the price of gas. The actual cost of coal was £5572, as against £4182 in the previous year. The works and mains had been kept in a state of thorough efficiency. The quantity of gas made for the year ended the 31st of March was 94,952,000 cubic feet, against 85,000,000 cubic feet during 1899. Alderman J. H. Blake submitted the minutes for adoption. Referring to the gas accounts, he said he did not think the word "loss" was a proper one to use, inasmuch as there was not an actual loss. The report showed that the interest which had been paid was £1952; on the sinking fund £1835 had been paid, and also £1500 as a portion of the cost of the new purifiers. In addition to this, they had expended a large amount on repairs and extensions of mains.

R. & A. MAIN, Ltd.

214, ST. JOHN STREET, CLERKENWELL GREEN, LONDON, E.C.

EDMONTON: GOTHIC WORKS. | BRISTOL: 28, BATH STREET. | MANCHESTER: 37, BLACKFRIARS STREET. | GLASGOW: ARGYLE WORKS, KINNING PARK. | FALKIRK: GOTHIC IRON-WORKS.

THE NEW "MAIN" PREPAYMENT METER COOKER.

Embodies all the latest and most perfect developments in GAS COOKING-STOVES

Hot-Plate and Oven Burners, Fixed or Removable at will.

FITTED COMPLETE WITH GRILLING AND BOILING BURNERS ON TOP.

Enamelled Door Plate and Loose White Enamelled Crown, extra.

Nos.	1211	1212	1213	1214
List Prices	46s. 0d.	47s. 6d.	52s. 6d.	56s. 6d.

Full Particulars and Special Quotations on Application.

The Earlestown and District Council have accepted the tender of Messrs. R. Dempster and Sons for constructing and fixing two purifiers. The price is £820.

The Local Government Board have sanctioned a loan of £8400 for pumping machinery, &c., in connection with the new artesian boring at Gainsborough.

The Barrowfield Iron-Works, Limited, have secured the principal contract for the erection of large sulphate of ammonia plant at the works of the Summerlee and Mossend Iron Company, Limited.

The Troon Gas Commissioners have accepted the following tenders for extensions at the gas-works: Purifiers and connections, Messrs. J. & R. Houston; station meter, Messrs. J. Milne and Son, Limited; and meters, Messrs. W. & B. Cowan, Limited.

The Read-Holliday Acetylene Company, Limited, have secured the contracts for the lighting of the townships of Trimdon Grange and Trimdon Colliery with acetylene gas. This is the first district in the North of England to have a system of street lighting entirely by acetylene.

The Smethwick Corporation Gas Department have placed an order for four purifiers, measuring 36 ft. by 24 ft. by 6 ft., complete with lifting apparatus, with Messrs. R. Dempster and Sons, Limited, of Elland, subject to the Local Government Board approving of the loan.

Messrs. Graham, Morton, and Co., Limited, of Leeds, have just issued a new illustrated catalogue comprising photographs of elevating and conveying plants erected by them during the past year. Power-transmission machinery and labour-saving appliances, inclined retorts, &c., are shown in great variety by a series of well-executed pictures, which have been copyrighted. The pamphlet, which furnishes just the particulars required by anyone contemplating the erection of plant for the mechanical removal of material, is of convenient size, well printed, and stitched in a fancy wrapper.

Messrs. Richmond and Co., Limited, have issued a "war calendar," excellently printed on cardboard, and eyeletted and strung for hanging. It gives a reproduction of the firm's cartoon poster, showing ex-President Kruger "Bringing his Goose to be Cooked." Underneath, follows a diary of the principal events of the war, commencing with the sailing of Lord Roberts on Dec. 23, 1899, down to the surrender of Pretoria on June 5, 1900. A calendar commencing July, 1900, and carrying over until the end of June, 1901, is printed at the bottom; thus showing the dates for the early months of next year. The well-known couplet in which the use of the firm's "Model" stove is advocated for first-class cooking is the only trade advertisement appended to the card, copies of which may be had by the trade on application to any of the Company's offices, or to the Advertising Department, 132, Queen Victoria Street, E.C.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to the Company as above.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT. Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London." London, E.C.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

PATENTS FOR INVENTIONS. Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.

Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ, HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.

Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

For all Joints in connection with Oil Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

ENRICH your Gas with cheap Benzol, Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.

Apply to SADLER AND CO., MIDDLESBROUGH,

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Waggons or Carboys. Highest references and all particulars supplied on application.

TO GAS AND WATER OFFICIALS.

HIGH-CLASS Cycles at reasonable and low Prices. Guaranteed for Twelve Months. Sent on approval. For Cash or Gradual Payment System. Send for Catalogue, Post Free.

MELROSE CYCLE COMPANY, COVENTRY.

PRACTICAL RETORT SETTERS.

GEORGE NUTTALL & CO., 32, Have-lock Road, Saltley, Birmingham.

Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, see Aug. 7, p. 382.]

FARNHAM GAS COMPANY, LIMITED.

THERE were 60 Applications for the Office of SECRETARY and MANAGER; and the Directors have this day elected Mr. S. G. Symonds, of Hertford Gas-Works, to the Post, in the place of William Wells, who has resigned after 42 Years as their Secretary and Manager.

Candidates for the Office will please take this as a reply to their Applications.

Aug. 17, 1900.

ADVERTISER (Gas Manager's Son, age 24, and an Abstainer) seeks employment as METER INSPECTOR and COLLECTOR. Five Years' experience in a similar capacity. Good References.

Address No. 3540, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Position as Clerk of Works, ASSISTANT or ENGINEER and MANAGER of Gas or Water Works. Twelve Years' Experience. Have served articles under a Civil Engineer. Shortly disengaged.

Reply to No. 3543, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a large Provincial Gas and Water Company for their Fitting and Mains Department, a FOREMAN. He must be a Plumber, and have a knowledge of both Gas and Water Fitting, and be competent to superintend Workmen and Main Laying. Liberal Wages to a satisfactory Man.

Apply, by letter, with Testimonials, and stating Wages required, to No. 3542, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application.
No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE; NEWBATTLE, DALKEITH, }

WANTED, experienced Retort Setters.

Apply to R. DEMPSTER AND SONS, LTD., ELLAND.

WANTED, a few young Men as Stokers. Good References required. Wages 5s. per day.

Apply to the MANAGER, Gas-Works, WALTON-ON-THAMES.

WET Gas-Meter Fitters wanted. Con-stant Employment and good Wages for competent Men.

Apply to JOHN WRIGHT AND CO., Thimblemill Lane, Aston, BIRMINGHAM.

DRAUGHTSMAN wanted for Con-tractor's Office. Must have experience in Designing and Detailing Gas Apparatus.

Apply, stating Salary required, Experience, &c., to No. 3534, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, thoroughly competent and experienced MAIN and SERVICE LAYERS. Permanent employment to steady, reliable Men.

Apply, by letter, stating full Particulars, with References, to No. 3539, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a thoroughly reliable and steady Man as LEADING STOKER. Must be a good Shovel Charger, and used to Engine and Exhauster.

For further Particulars apply to H. C. SHEPHERD, Manager and Secretary, Gas-Works, Old Swindon, WILTS.

WANTED, at once, a good and reliable WORKING FOREMAN for Retort-House and Yard. Must be used to Regenerative Firing, &c. Preference to one able to do Works Fitting. Wages 33s. Works 32 millions; about 30 miles from London.

Apply, by letter, to No. 3546, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Spondon, Ockbrook, and Borrowash Gaslight and Coke Company, Limited, require the Services of a Man as MANAGER and GAS-FITTER. Must be a good Carbonizer, Layer of Mains and Services, and understand Gas-Engine and Exhauster. House, Fuel, and Light free.

Apply, with Testimonials, and stating Salary required, to the SECRETARY, care of Hart and Sibbald, 43, Wardwick, DERBY.

PETERBOROUGH GAS COMPANY.

WANTED, a competent Clerk. Must have a thorough knowledge of Gas Accounts. Salary £120 per annum.

Applications, by letter, stating Age and Experience, and accompanied by three Testimonials of recent date, to be addressed to the undersigned, and sent in on or before the 28th inst.

JOHN BARTON,
Secretary.

Gas-Works, Peterborough,
Aug. 17, 1900.

WANTED, additional Meter Inspectors, by a Gas Company in the South of England. Must be competent Men, of good address, accustomed to both Ordinary and Prepayment Meters, and able to fix the same or execute ordinary Repairs.

Apply, by letter, giving Age, Experience, and Wages desired, to No. 3541, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a large Provincial Gas Company, a first-class ASSISTANT for GAS STOVE and FITTING SHOW-ROOM. Must be of good address, and capable of advising Consumers; also good Window Dresser. Age about 30.

State Salary, and enclose *copies* of not more than three Testimonials, to RICHMOND AND CO., LIMITED, 132, QUEEN VICTORIA STREET, E.C.

CUTLER ¾ million per day Water CONDENSER FOR SALE. Accept £120 on Rail, Berkshire, if sold this month.

J. F. BLAKELEY, Thornhill, DEWSBURY.

BOILER, 18 ft. by 5 ft., wanted to work at 100 lbs. Pressure.

State Price and full Particulars to JOHN E. WILLIAMS AND CO., Victoria Paint Works, Lower Moss Lane, MANCHESTER.

FOR SALE—Twelve 5 per cent. PREFERENCE SHARES in Glover and Main, Limited.

Address No. 3545, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOILERS FOR SALE.

TWO Second-hand 10-Horse Power CORNISH BOILERS, now at the Enfield Gas Company's Works at Ponders End, FOR SALE.

Offers to the GENERAL MANAGER, Enfield Gas Company, Sydney Road, ENFIELD.

GASHOLDERS for Sale—

22 ft. diameter by 10 ft. deep, Four Columns.
24 ft. " 10 ft. " "
25 ft. " 12 ft. " "
30 ft. " 10 ft. " Five Columns

JAS. WRIGHT, Bridge House, Blackfriars Bridge, LONDON, E.C.

FOR SALE—A U Section of Hydraulic MAIN for a Setting of Seven Retorts, with MOUTHPIECES, LIDS, ASCENSION and CROSS PIPES complete. Mouthpieces ∩ shape, 16 in. by 16 in.

Apply J. CHAMBERS, Gas Offices, HENLEY-ON-THAMES.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

SECOND-HAND PHOTOMETERS.

MESSRS. Alex. Wright & Co., Ltd., have several second-hand EVANS & LETHEBY PHOTOMETERS, complete with Instruments in thorough working order and good condition, which they can offer at greatly reduced Prices.

Write ALEX. WRIGHT AND CO., LIMITED, Precision Works, 81, Page Street, WESTMINSTER, S.W.

J. FIRTH BLAKELEY & CO., Thornhill, Dewsbury, have FOR SALE:—

One Set of Three 6-ft. PURIFIERS.
One " Two 8-ft. "
One " Four 8-ft. "
One " Four 16-ft. by 12-ft. PURIFIERS.
Four 5-inch ANNULAR CONDENSERS.
Four 10-inch " "
Six 16-inch " "
"Cutler" ¾ million WATER" CONDENSER.
EXHAUSTERS, 2000 to 60,000 Cubic Feet per hour.
"Holmes" & "Clapham" WASHER-SCRUBBERS.
"Livesey" & "Cripps" WASHERS.
4-in., 6-in., 8-in., and 10-in. STATION METERS.
Splendid GASHOLDER, 50 ft. by 20 ft.
RETORT IRONWORK, MODERN HYDRAULICS.
Telegrams: "BLAKELEY, THORNHILL LEES."

TENDERS FOR TAR.

THE Harrogate Gas Company invite TENDERS for the surplus TAR for the Twelve Months ending Aug. 31, 1901.

Particulars to be obtained of the undersigned.

Tenders to be sent in by the 28th inst.

H. WILKINSON,
Secretary and General Manager.

Gas Offices, Harrogate,
Aug. 13, 1900.

CITY OF RIPON.
(GAS-WORKS DEPARTMENT.)

THE Corporation of Ripon invite TENDERS for erecting Two SETTINGS containing Sixteen Retorts, at the Gas-Works.

Plan and Specifications, prepared by Mr. E. E. J. Anderson, M.I.M.E., may be seen, and any further Information obtained, at the Gas-Works, between the hours of Nine a.m., and One p.m.

Tenders must be sent in on or before Monday, the 27th of August inst. to my Offices.

The acceptance of the lowest or of any Tender is not guaranteed.

By order,
M. KIRKLEY,
Town Clerk.

Town Hall, Ripon,
Aug. 14, 1900.

TAR AND LIQUOR.

THE Eccleshill and Bolton Gas Company invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR to be produced at their Works, together or separately, for One Year from the 1st of September next. Can be delivered in Contractor's Tanks, if required, at Eccleshill Station (G.N. Rly.).

Coal carbonized per annum, 3000 Tons.

Tenders, sealed and endorsed, to be sent to the undersigned not later than Monday morning, the 3rd of September.

J. MELLOR,
Secretary.

Gas-Works, Eccleshill,
Bradford, Aug. 18, 1900.

SAFFRON WALDEN UNION.

TENDERS FOR COAL.

THE Guardians of the above Union are prepared to receive TENDERS for the supply of about 150 Tons of best hand-picked hard STEAM COAL for Six Months from the 4th day of September next.

Full Particulars can be obtained on application to Mr. Turner Collin, Saffron Walden.

Sealed Tenders, endorsed "Tender for Coal," to be sent to me the undersigned, not later than the 1st day of September next.

The lowest Tender will not necessarily be accepted.

By order,
TURNER COLLIN,
Clerk.

Saffron Walden,
Aug. 15, 1900.

BOROUGH OF EAST RETFORD.
(WATER UNDERTAKING.)

THE Committee of the above invite TENDERS for the SINKING of an additional WELL and BOREHOLE, and the EXCAVATING of ADITS on the Site of the present Works.

The Plans may be seen on or after the 15th inst.; and Copies of the Specification and Forms of Tender may be obtained from the Engineer. A Deposit of One Guinea will be required, which will be returned on receipt of a *bonâ-fide* Tender, and the return of the Specification.

Sealed Tenders to be delivered to the undersigned on or before Sept. 1, 1900, endorsed "Tender for Water-Works Extensions."

The Committee do not bind themselves to accept the lowest or any Tender.

J. B. FENWICK,
Engineer.

Gas and Water Offices,
Retford, Aug. 9, 1900.

FYLDE WATER BOARD.

THE Board are prepared to receive TENDERS for the supply of 15-inch, 12-inch, and 9-inch diameter CAST-IRON PIPES and SPECIAL CASTINGS, which are to be delivered at some, one, or all of the following Railway Stations—namely, Ansdell, Lytham, Moss Side, Wrea Green, and Kirkham, on the Lancashire & Yorkshire and London & North-Western Joint Railway, in the County of Lancaster.

Copies of Specification and Schedule of Quantities may be obtained at the Office of the Engineer, Mr. Wm. Wearing, Assoc.M.Inst.C.E., 34, Victoria Street, Blackpool, on and after Monday, the 13th inst., on payment of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Fylde Water Board, Tender for Pipes," and addressed to the Chairman, Fylde Water Board, 34, Victoria Street, Blackpool, to be delivered not later than Monday, the 3rd day of September, 1900.

The Board do not bind themselves to accept the lowest or any Tender.

T. LOFTOS,
Clerk to the Board.

Aug. 8, 1900.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

AMENDED NOTICE.
ALTERATION OF TIME OF MEETING.

NOTICE is Hereby Given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, Willoughby Lane, Tottenham, on Saturday, the 25th day of August inst., *at Twelve o'clock Noon* precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June, 1900; to declare a Dividend for the same period, and for the election of Two Directors and an Auditor for the ensuing Year; to consider the Notice of Motion given at the Meeting held on the 24th of February last—viz., "That at the Annual General Meeting to be held on the 25th of August next, it be resolved that the Half-Yearly Meetings of the Proprietors be held in the months of February and August, the day and hour to be fixed by the Directors;" and for the transaction of General Business.

The TRANSFER BOOKS will be closed for the Consolidated Stocks from the 10th to the 27th inst., both days inclusive.

By order of the Board,
JAMES RANDALL,
Secretary.

Offices of the Company:
Willoughby Lane, Tottenham,
Aug. 10, 1900.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

TO THE PROPRIETORS.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, London, on Friday, the 7th of September, 1900, at Two o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1900, to declare Dividends, to elect Auditors, and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 25th of August to the 7th of September, both days inclusive.

By order,
ERNEST L. BURTON,
Secretary.

5, Great Winchester Street,
London, E.C., Aug. 20, 1900.

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ISSUED BY
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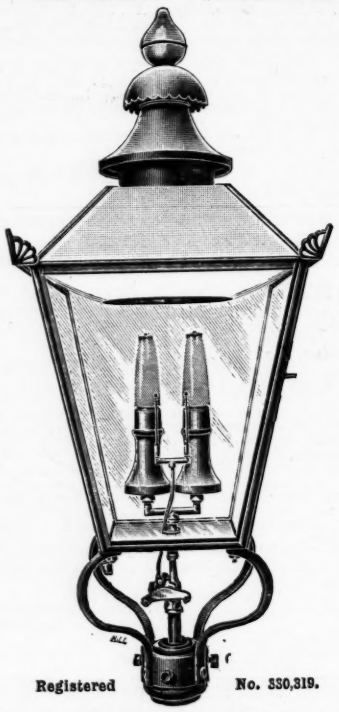
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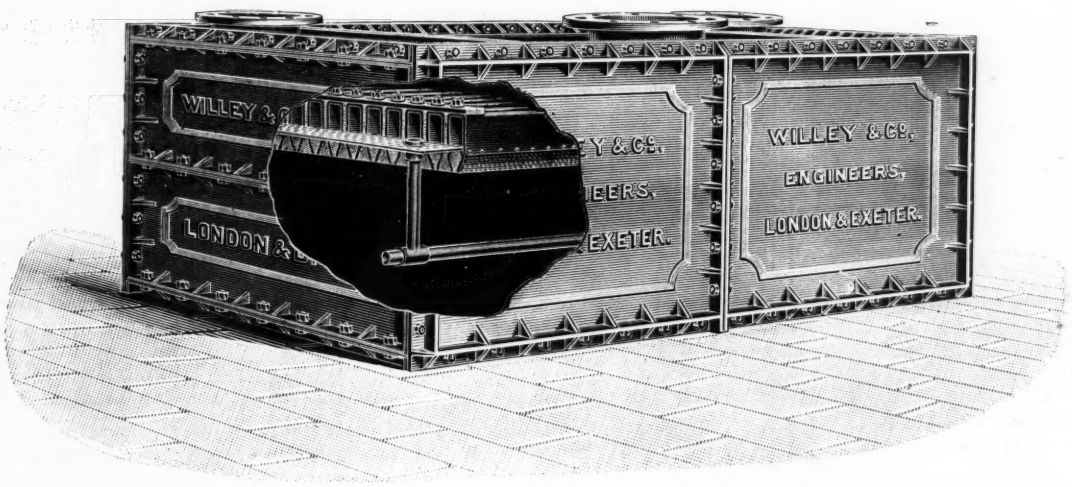

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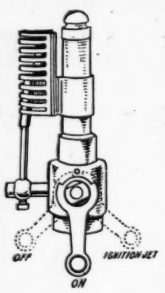

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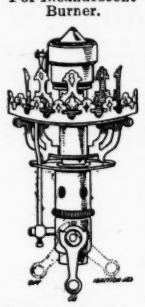

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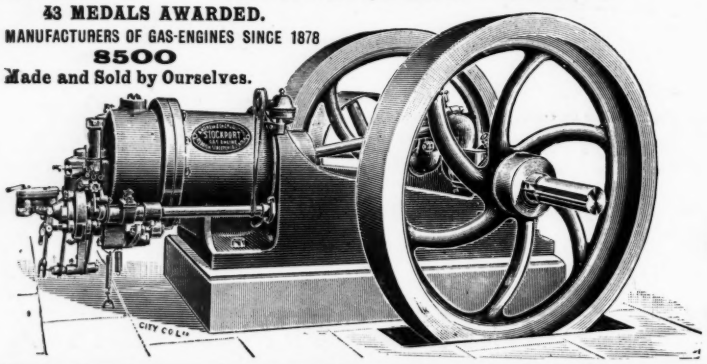

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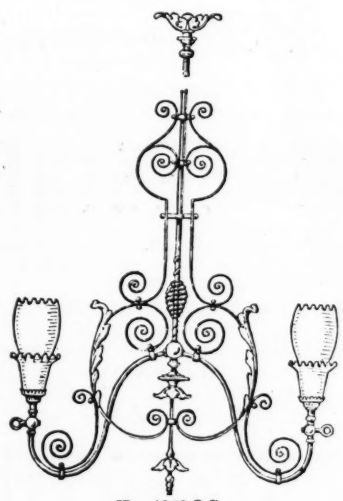

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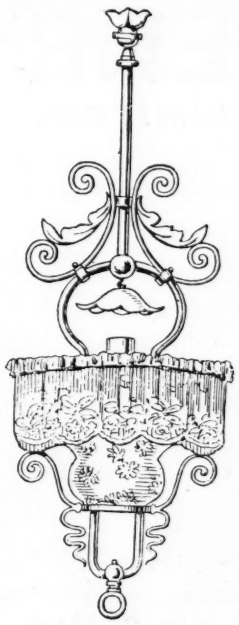

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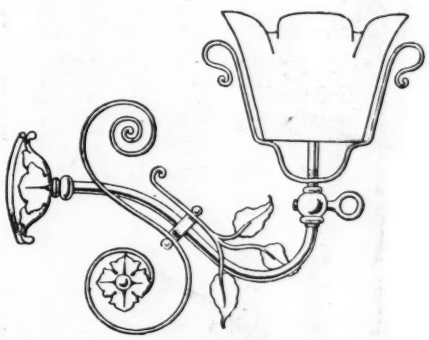

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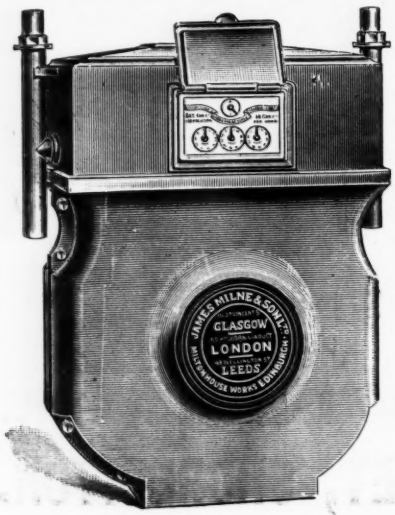

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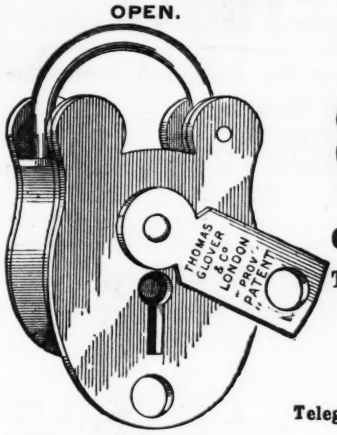

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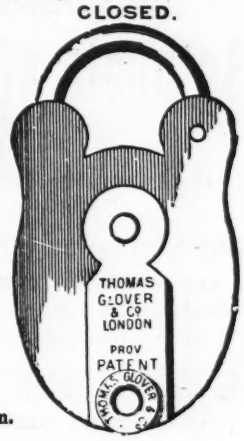

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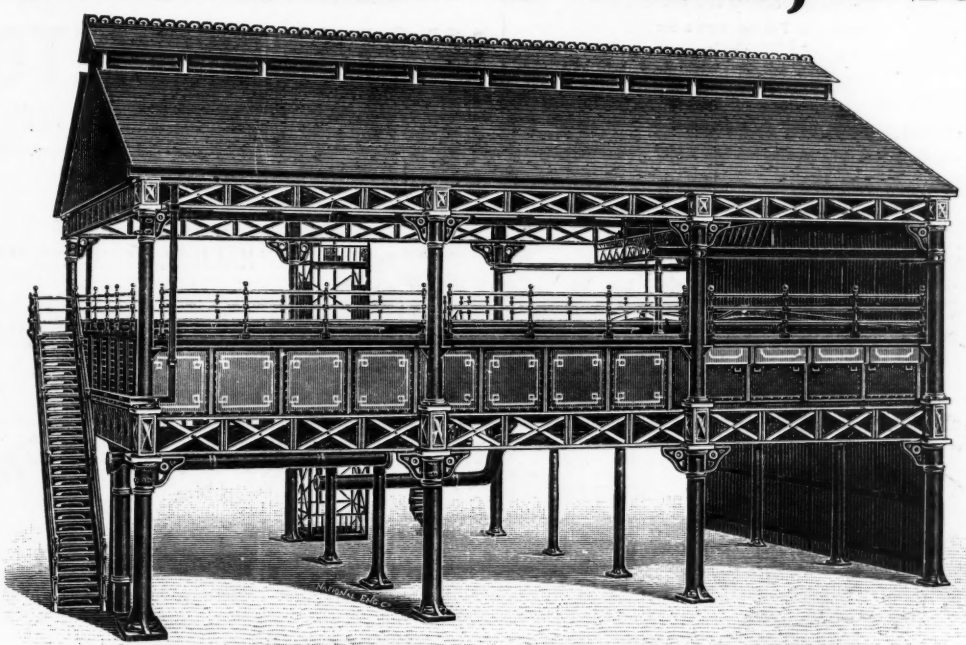

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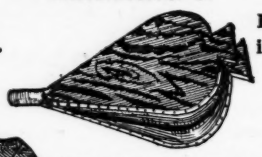
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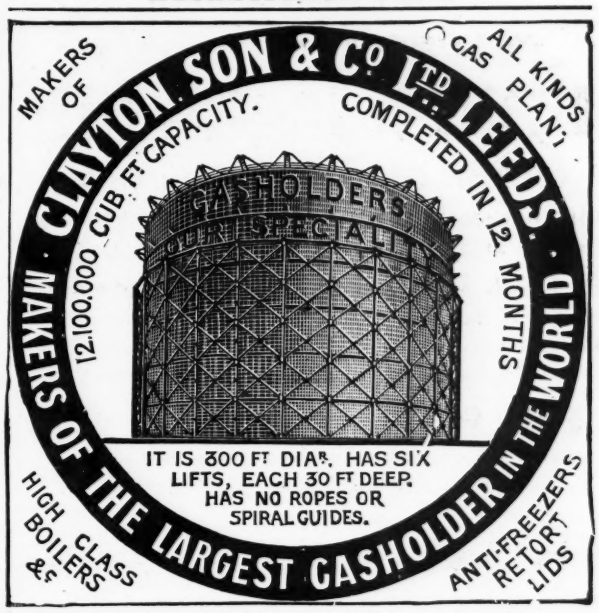
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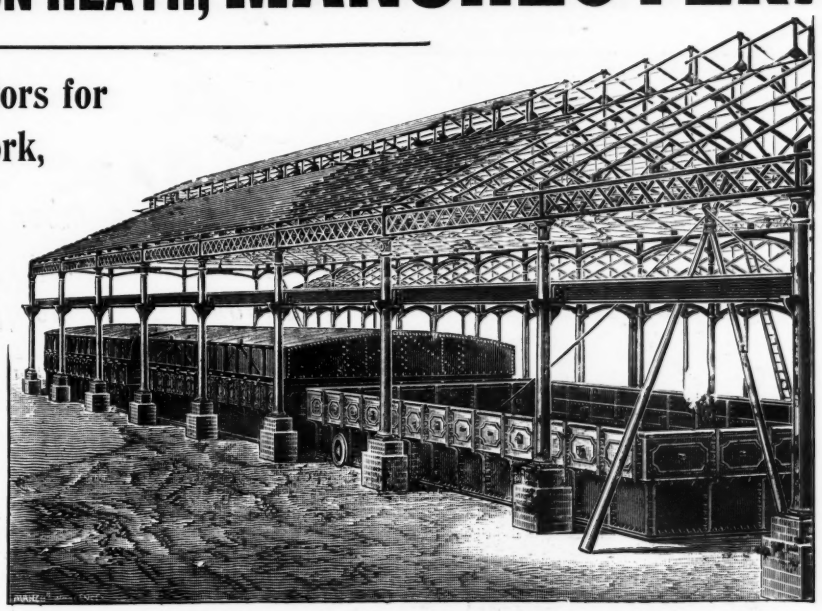

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[See also Advt. p. 456.

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